

Nature *Magazine*

VOLUME 33

NUMBER 3



MARCH 1940

35 CENTS

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Wilderness Trail Trips

A pair of good legs, love of the outdoors and an interest in Nature are three requisites for a different and enjoyable vacation worked out by H. Frank Evans, Ranger-naturalist at Glacier National Park, a graduate of the Yosemite Field School of Natural History. Mr. Evans is an outdoorsman with a real knowledge of Nature. During his summers with the Park Service he found that many people were interested in taking vacations on foot, but did not know where to turn for congenial companionship, competent leadership and proper equipment for such a vacation. So Mr. Evans made two solo reconnaissance trips into the Selway-Bitterroot Primitive Area of Idaho and Montana, plotting his Wilderness Trail Trips. He has mapped out a series of twelve-day and twenty-four-day trips starting June 17, and 28, July 11 and 22, August 4 and 15 for the shorter trips and June 17, July 11 and August 4 for the longer. Rates are moderate. Equipment and supplies go on pack animals; packing and cooking is done by the staff. Full details may be obtained from H. Frank Evans, Carbon-dale, Illinois.

Kindling the Fire

Inventions are proverbially born of necessity, but sometimes they come from dissatisfaction with available means to a certain end. This was the case of an Oregon man who spent a great deal of time in the woods and who tired of having to hunt up wood dry and light enough to give his campfire a good start. Experimenting at home, he finally evolved a kindling stick that would light at the touch of a match and burn long enough to start a good-sized campfire. Fellow woodsmen swamped him with requests until finally he packaged these sticks in bundles enough to start 45 fires, named them Kindelstyx and put them on the market. Light in weight, they are no problem to carry and are winning wide popularity.

Where Credit Is Due

In making the illustrations for our article on the sea otter in the October, 1939, issue of *Nature Magazine*, R. Bruce Horsfall had recourse to several sources of material. The most important of these was a notable article by Edna M. Fisher entitled "Habits of the Southern Sea Otter," published in the February, 1939, issue of the *Journal of Mammalogy*. Miss Fisher illustrated her article with outline drawings showing several positions of this interesting mammal in the water. She should, therefore, be given credit for having provided our artist with foundation material for his illustrations.

Botanical Report

According to the annual report of the Director of the New York Botanical Garden, Dr. William J. Robbins, the number of specimens in the herbarium grew thirty thousand during the past year to a total of 1,963,238. Attendance at lectures and botanical courses increased greatly, and all of the facilities of the Garden were in greater demand during 1939. Joseph R. Swan was re-elected president of the Garden at its annual meeting.



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BY NORRIS W. HARKNESS

CAVES

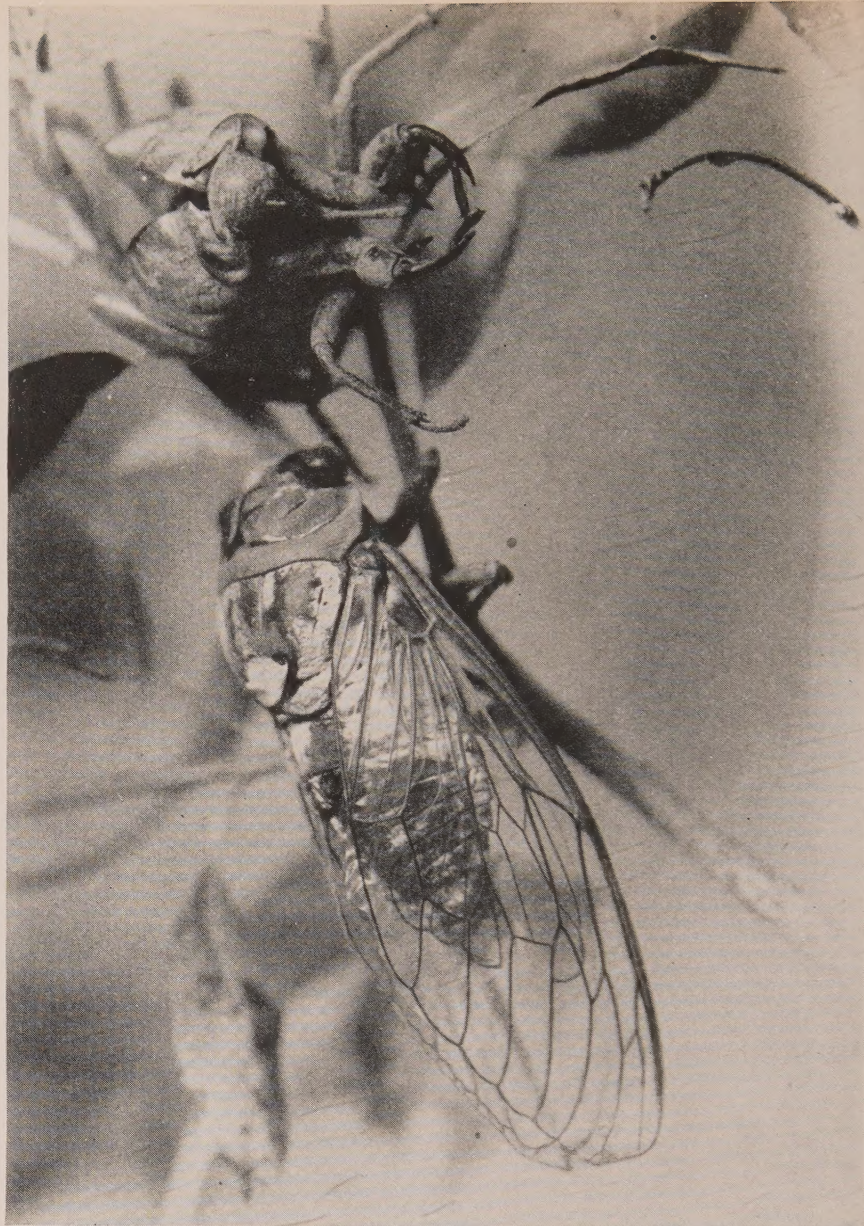
To me, as a boy on a Virginia farm, one of the most fascinating places in that square mile of land was a cave whose extent was unknown. The entrance, in a mass of rocks at the top of which a family of turkey buzzards had their nest, was a small hole through which a grown man had difficulty in wriggling. Throughout the country there are caves of various shapes and sizes, ranging from such obscure spots as this one to the commercialized underground theaters like the Mammoth Cave.

For the photographer who is fortunate enough to be within the reach of one of these semi-explored holes, there are opportunities for unusual and interesting pictures. Most of the smaller caves serve as homes for many kinds of animals, and there are many picture possibilities in the animal tracks on the mud of the floor. The stalagmites and stalactites that we almost always find, and the general architectural wonders of this natural construction, are good subjects. In larger caves we often find families of bats that, throughout the colder months of the year, are hibernating and may easily be photographed.

Of course, if your cave has not been developed commercially, and for picture purposes I hope it has not, certain precautions must be taken. Almost without exception caves are damp and muddy—they are definitely not the place to wear our Sunday clothes. Many of them serve as homes for skunks, which are not pleasant to meet at close quarters; some of them may contain snakes, which may or may not be dangerous. Then there is the ever-present danger of getting lost, and underground all the rooms and passageways have the unhappy faculty of looking alike. The wise man is not content to depend upon chalk marks or any such blazes, but leaves behind him a continuous string that he can follow back to the mouth of the cave.

But let us get back to the pictorial side of our explorations. Since the entrance of the cave is the best place for animal tracks, a careful search will undoubtedly find the dining room of some of the cave's residents. There we shall probably find not only tracks but the skeletons of small animals. These will make interesting, although not necessarily attractive, pictures. Deeper in the earth we come upon the limestone formations of stalagmites and stalactites, often encrusted with mud, but which sometimes offer most attractive photographic studies. A group of these natural pillars has real possibilities.

In making these pictures two forms of lighting are possible. In the larger caves we may work with torches held against a wall by some member of the party, or we may fall back upon the trusty flash bulb. Flash powder should not be used because of the dense clouds of smoke and ash that follow the flash, but the bulb, working either with a synchronizer or by the open flash method, works splendidly. Exposure data for various dis-



CICADA AND PUPA CASE. PRIZE-WINNING PHOTOGRAPH IN NATURE MAGAZINE'S CONTEST. THE PHOTOGRAPHER IS V. A. WINN OF CROOK, COLORADO

tances have been given in these columns on several occasions. Usually it is better to include some members of the party in the picture, as otherwise we have no way of knowing the size of objects, and the presence of the humans adds to the pictorial effect as well as to the, shall we say, historical value of the pictures.

One further precaution must be taken. In most of these small caves we shall have to crawl and slide, and our camera needs the protection of a substantial case. And let us not forget that many caves are strongly-colored and are good subjects for color film. Manufacturers of the film or of the flash bulbs can furnish us with the information as to the correct filter to use for flash work, and the question of exposure is greatly simplified in the flash technique since the only thing to be considered is the distance from the bulb to the subject.

If you are lucky enough to have access to a cave, you will find an exploring trip with the camera well worth while.

A while ago we spoke of bats, but caves are not the only places in which we find them, and they are a subject that has been rather

neglected, photographically speaking, because of the difficulty in making really good pictures of them. There are many bat pictures that were made during hibernation, but comparatively few that show them in flight, for they are far from easy to do. The prime requisites for such pictures are, of course, a flash synchronizer with the shutter at the highest possible shutter speed to stop the rapid motion of their flight, and the setting for the picture that forces the bats to fly fairly close to a given point. I remember, as a boy, standing in the belfry of a church steeple and being terribly frightened by the flight of what seemed like millions of wings past my face. Today I would try to take up a position some ten feet from the opening through which the bats came, and, with the aid of a confederate, who would drive our prey out at the proper time, I would focus the camera, with the help perhaps of a flash light, so that it would include the opening as a background, and then attempt the exposure with the flash bulb and my shutter set at its highest speed. With luck, I would have a picture.

If any of the readers of *Camera Trails* do have any pictures of this kind, I would

enjoy seeing them and learning the full details of their making.

CORRECT EXPOSURE

Several readers have been puzzled by the term "correct exposure". For the average scene that has a moderate contrast range between the brightest and darkest tones in the picture area there are many exposures that might all be called correct. All the tones in the negative resulting from each possible exposure would bear a correct relationship to



CHICKADEE INVESTIGATES. PRIZE-WINNING PHOTOGRAPH TAKEN BY HUGH M. HALLIDAY, TORONTO, CANADA

each other. To make this clear, a picture of extreme contrast, like a brilliantly-lighted snow scene, containing bright snow and dark tree trunks, might have a contrast range so great that the exposure would have to be perfect in order to record detail in both the highlights and the deep shadows. That is why we have often recommended making several different exposures of these pictures so that we may be sure that one of them is absolutely right.

On the other hand, a scene of very low contrast range, like a portrait in which the highlights might be only five or six times as bright as the darker area, might be given exposures of perhaps two stops more or less than that called for by the meter without loss of any detail in the resulting picture. As a parallel, we might consider that the tone range of the negative is like a long rod and the scale of our picture a shorter rod. If the picture scale rod is very short, it may be placed in many positions along the long negative scale rod without duplication. But if it is very long and approaches the negative rod in length, there may be only one or two places in which we can put it, without having the two positions too nearly alike.

For practical purposes, the moral that we draw from this is that, when our picture has an extreme range of contrast, we must be careful to expose accurately, and when the picture range is short we have a much greater latitude in the accuracy with which the exposure may be made without danger of falsifying tones at either end of the scale.

THE CONTEST

It is extremely gratifying to see the number of entries for the Camera Trails increase from month to month, and the number submitted for March is equal to the total for January and February.

As a whole, the print quality is better and there is every evidence of an increasing keenness in the competition. One thing is noticeable about the group—bird and animal pictures are better done than are those of plants and flowers. Two chief difficulties seem to beset that latter class—background and lighting. In most cases, the lighting is too flat and it would seem that most of these shots have been made too quickly after the subject was discovered. In several cases, the pictures would have been outstanding had the light been coming from a greater angle, and in almost all of this group the camera lens was stopped down too far with the result that too much of the background material is sharp. This naturally distracts our attention with consequent loss of effectiveness of the central figure in the composition. In several cases the use of a black cloth in the background, as suggested some time ago, would have been of material assistance. This criticism does not, of course, apply to all the entries, but we, as Nature photographers, must pay great attention to details, if we are to make the kind of pictures we really want. I feel that the entrants are to be congratulated for their excellent work, and an inspection of all the pictures thus far forces real admiration for the work of the winners. This month the two winners are V. A. Winn of Crook, Colorado, and Hugh M. Halliday of Toronto, Canada, and the runners-up, whose pictures will, I hope, be reproduced at some other time, are Lloyd M. Ingles of Chico, California, and Elmer T. Gilbert of Olneyville, R.I. We offer them all our most sincere congratulations.

The rules of the contest are so simple as to be practically non-existent. Just write your name lightly on the back of each print you submit and mail them to Norris W. Harkness, 320 East 42nd Street, New York. They may be of any size up to 8 x 10" and may be on any kind of paper that you wish. White paper, either glossy or mat, is better for reproduction. No entry blanks or other formalities are needed and the mailing of your prints with your name on them is all that is required. Entries received before March 15 will be entered in the May Contest. The monthly prize awarded to each of the two winning prints is your choice of any of the following books:

Photo-Lab-Index, by Henry M. Lester; *Nature Photography Around the Year*, by Percy A. Morris; *New Ways in Photography*, by Jacob Deschin; *The Fun of Photography*, by Mario and Mabel Scacheri; *Photography*, by Dr. G. E. K. Mees; *Finding New Subjects for Your Camera*, by Jacob Deschin; *Eyes in the Night*, by Tappan Gregory.

And some one of these monthly winners will receive the \$25 merchandise award from Willoughby's, Inc., 110 West 42nd Street, New York, as a grand prize at the end of the contest. Send your entries early and often!

THIS AND THAT

A great deal of interest was aroused at the General Electric Show of Photographic Lighting Equipment in New York. One of the

(Continued on page 176)



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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and
Devoted to the Practical Conservation of the Great Natural Resources of America

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Atlanta—Walton Building
Los Angeles—Western Pacific Building
San Francisco—Mills Building
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NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C., U. S. A. Additional entry at Greenwich, Conn. \$3.00 a year; foreign \$3.75.

Publication and Editorial Office, 1214 16th Street, N. W., Washington, D. C. Additional Office of Publication, Greenwich, Conn.

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Holland Bulb Industry

One of the many attractions of the "city within a city"—Rockefeller Center in New York—are the varying flower displays on the plaza and on the twelve roof gardens. This spring there will be a planting of 40,000 assorted tulips, 10,000 hyacinths, 3000 crocuses and 3000 daffodils, which will provide a notable exhibit when May rolls around. In view of this it is singularly appropriate that the office of the public relations department of the Holland Bulb Industry of Haarlem, Holland, should be moved to 10 Rockefeller Plaza. In fact, this address is known as "Holland House". If you want to know anything about tulips, what to get and where to get them, Miss Margaret Herbst, who directs the public relations department at this address, can tell you.

Conservation Text

Conservation of Renewable Resources by E. M. Dahlberg has made its appearance in a new and revised edition, the chief change being the addition of a chapter on the conservation of human resources. There are some minor textual changes and an increased number of illustrations. Its author is both a teacher and a former member of the Wisconsin Conservation Commission, thus possessing the happy combination of a background of conservation knowledge and an appreciation of teacher requirements. This book is published by the C. C. Nelson Publishing Company, Appleton, Wisconsin, at one dollar.

Camera Annual

Photography celebrated its centennial year and one of the most striking evidences of the distance that this art has travelled in the past century is to be found in the *U. S. Camera Annual 1940*. Containing more than three hundred pictures in black and white and color, the work of this country's leading professional and amateur photographers, this book will be a delight to anyone, whether or not they work or play with a camera. The book has been edited, with brief correlative text and captions, by T. J. Maloney. There is an interesting prefatory chapter summarizing the progressive achievements in photography since the days of Daguerre. The book, which is presented in the loose-leaf type of binding, is arranged in twelve sections that are interesting but not arbitrary. The engraving and the printing are superb, and the paper maker and ink maker have collaborated perfectly. Published by Random House, the *Annual* sells for \$2.95.

Carolina Gardens

The gardens of the Carolinas attract thousands of visitors every year. These people come fully as much for the historic associations of these gardens as for the beauty of the gardens themselves. In fact, it is the history that gives them their special charm. Anyone who has visited or plans to visit the gardens of the Carolinas will find joy in *Carolina Gardens* by E. T. H. Shaffer. The author, in a second edition of the book, paints the picture of the history, and of the present, in fascinating and informative terms. Published by the University of North Carolina Press the book is priced at \$3.50.



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The Album is a 24-page book, handsomely trimmed with red. It contains spaces for each individual stamp with a complete description and all pertinent facts which every outdoorsman should know. In addition, there is a foreword on conservation by Ding Darling, famous cartoonist and leading conservationist, plus a story on the natural resources of this country. The Album itself should be in the library of every thinking sportsman. It tells how you can help improve hunting and fishing and what the National Wildlife Federation has already done toward this end.

The 116 attractive colored stamps represent the 1938 and 1939 issues of the Federation's annual Wildlife Conservation Week drive. Collectors are already interested in these sets and place a premium on them.

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Indoors and Out

By HOWARD ZAHNISER

THE Saxons used the term "Hreth Monath", or Fierce Month, to designate this part of the year that we call March, which in recent years has become the appointed time for an annual mobilization of nation-wide and continent-long efforts in behalf of that earnest and yet gentle cause of wildlife conservation. There have been times when it has seemed possible that the rousing indignation of conservationists might make a recollection of this old Saxon term seem appropriate, but there is always the possibility also that the talking and speech-making that must inevitably accompany such an effort among us articulate human beings may fall so far short of influencing our actions as to bring to mind only our own popular description of March as the windy month. "Be ye doers of the word and not hearers only."

The comparison of speech-making with the movement of the winds is usually a disparaging one, but there may also be some hopefulness in the thought. Sir Hubert Maxwell wrote in the First Series of his *Memories of the Months*: "Every lover of Nature has cause to rejoice at one result of the great wind of March 24, 1895, namely the righteous ruin which has overtaken many of those odious field advertisements which disfigure the landscape." If by annual conferences and intensified evangelism we can so concentrate the force of the spoken and written word as to drive out misunderstanding and drive in facts, and see this taking place in many minds, we may be justified in the faith that we are doing something worthwhile.

The aspect of futility that our preaching often seems to have may be merely the result of the continuing necessity for repeating it, considered for the moment aside from its continuing effectiveness. Sir Herbert Maxwell, rejoicing at the bill-board destruction, exclaimed: "May Priapus, god of gardens, blister every hand put forth to erect them again!" Yet we are still fighting—and with some success, we hope—against this same disgrace to the landscape, and we trust that we shall never be effectively dismayed by the specter of futility.

Certainly this generation (and I was born in this century) has witnessed enough both to motivate and to encourage strenuous efforts for wildlife conservation. Eight years ago, in March of 1932, the last heath hen was seen for the last time. The heath hens of our generation never did constitute more than a remnant. Their largest population of about 2000 estimated twenty-five years ago was at best only a basis for optimism. In 1917 after a disastrous fire on the one area where they survived and after a hard winter that brought also a heavy migration of goshawks, there were only about 150 heath hens left, and these dwindled down to the lone survivor that was last seen on March 11, 1932. An observation of this anniversary would certainly be a solemn preparation for celebrating a week set aside for promoting wildlife conservation.

Although the fate of many of our species of American wildlife is so familiar to a large number of us as to make discussions seem almost trite, there are doubtless many

others who have never perceived its implications. More—and enduring—memorials might have profound influences on our future attitudes toward the wild creatures. Recently after listening to a dramatization of the history of wildlife in this country as broadcast by the Columbia Broadcasting System on the United States Department of the Interior's "What Price America?" program, W. R. Kern, a naturalist of Hayward, California, was moved to propose the "erecting of a suitable and permanent monument or edifice as a constant reminder to present and future generations of the ending which overtook the Passenger Pigeon," another species of which the last remnant was seen in our generation.

In March of 1830 John James Audubon bought 350 passenger pigeons in a New York market at four cents apiece, but it has been a great many years since the March winds have buffeted the innumerable migrating flocks of these birds that once flew northward during this month. Conservationists have not allowed the passenger pigeon's fate to be forgotten, but so far as I know there have been no monuments erected. In the national capital, where Mr. Kern suggests that his proposed memorial be located, there are many sculptures of eagles in public places. The four famous bronze bison by A. Phimister Proctor stand on the corners of one of the bridges, and there are panthers on the corners of another bridge. On the Navy and Marine Memorial on the banks of the Potomac there are sea gulls in bronze so well sculptured as to produce with the help of the magic of moonlight a most convincing illusion. There is no sculptor living now who has seen the full reality of the passenger pigeon, but if the miracle of art could recall something akin to the impression that this bird made on those who did see it in flight I have no doubt that the poignancy of its passing would continuously move many to will that no other creature should meet a similar fate. It would be interesting to know if there are many others who share Mr. Kern's enthusiasm for this sort of exhortation.

The exhortations of the spoken and the written word, the enthusiasm and organization that develop in conferences, and the actions of conservation agencies that have been set in motion within the past decade have already produced results that give more encouragement than any earlier generation of conservationists has been warranted in enjoying. Having learned the faint hope of working with remnants, we hope that our actions and attitudes in the future may be such that no other species will be permitted to reach a status that may be described as that of a remnant. We are, indeed, seeing things accomplished, and we can trace much of our accomplishment to the mobilization of public interest. Our indoor meetings are producing outdoor benefits, and perhaps it is altogether appropriate to endow with significance the fact that National Wildlife Week beginning on March 17 includes the equinox—the accepted beginning of spring, the season of growth and preparation for increase.



ILLUSTRATION BY E. JACOBS
AFTER E. BOSTLEMANN

YOUNG DRAGONFISH, KNOWN TO SCIENCE AS *ARISTOSTOMIAS*, STRUGGLE OVER THEIR FIRST LARGE PREY—A SCARLET SQUID. IN SEIZING THEIR FOOD, THESE FISH TEMPORARILY DISLOCATE THEIR OWN JAWS WITH A MIGHTY FORWARD THRUST. TO HELP GIVE THEM FREEDOM OF MOVEMENT, THE FLOOR OF THE MOUTH IS ATTACHED TO THE JAWBONES ONLY BY AN ELASTIC LIGAMENT. ALTHOUGH THEY ARE LESS THAN THREE INCHES LONG, THE FISH ALREADY LOOK LIKE ADULTS, BEING FULLY EQUIPPED WITH LONG, SHARP FANGS, BLACK SKINS, SILVER CHEEK LAMPS AND MAGENTA-COLORED BODY LIGHTS. IN CONTRAST, THE LARGEST KNOWN DRAGONFISH—*BATHYSPHAERA*—MEASURES AT LEAST SIX FEET LONG. THEY WERE SEEN BY DR. WILLIAM BEEBE FROM THE BATHYSPHERE. AT THE RIGHT THE AUTHOR SUGGESTS THE PRIDE OF DRAGON PARENTS OF OLD WATCHING THEIR BABY PRODUCE ITS FIRST PUFF OF FIRE AND SMOKE



NATURE MAGAZINE

VOLUME 33 • MARCH • 1940 • NUMBER 3

Sea-Dragon Nursery

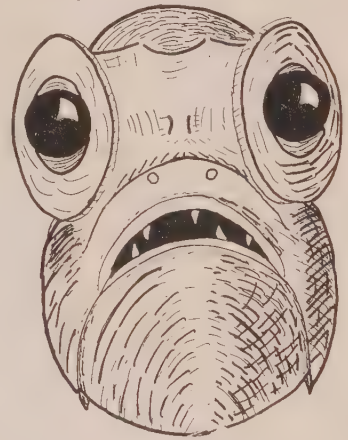
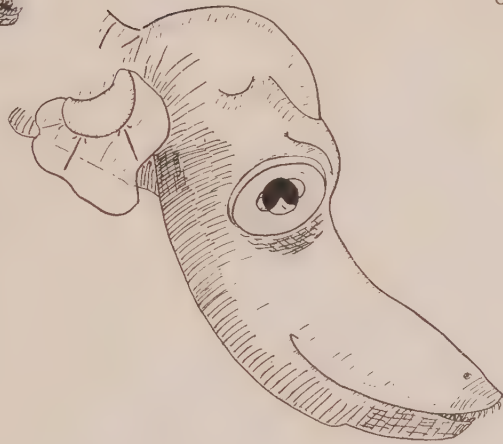
The ocean depths yield secrets of a strange group of fishes

By JOCELYN CRANE

*Technical Associate, Department of Tropical Research,
New York Zoological Society*



INFANT DRAGONFISH SIT FOR THEIR PORTRAITS. THE LEGENDS IN THE FAMILY ALBUM WILL READ, FROM LEFT TO RIGHT, *EUSTOMIAS*, *LEPTOSTOMIAS* AND *MELANOSTOMIAS*, AND THEY ALL BELONG TO THE SAME FAMILY. LITTLE "MELLY", AT THE RIGHT, HAS STARTED TO LOSE HIS FIRST TEETH AND SOON WILL CUT THE GIANT FANGS OF A GROWN-UP SEA-DRAGON



IN DAYS of old, when a brave hero rode forth to slay a dragon, his lance and sword were of the best—but, unfortunately, he carried no candid camera and left us no really adequate idea of what a proper dragon looked like. We do not know how big the creatures grew (heroes of that day, like modern fishermen, were doubtless apt to exaggerate), how long their claws were, or the exact pattern of the teeth. Then, too, the hero was always so busy vanquishing his foe and rescuing the maiden-in-distress, that he failed to record for posterity whether the flame from the beast's nostrils flashed scarlet or blue, or exactly what his roar was like or—most important of all—whether the dead monster left behind him any bright-eyed baby dragons peering frightened from a cave. It is this lack of knowledge about the babies that I regret the most. How big were they when they were born? When did they cut their teeth? How soon could they fly? And when did they breathe forth their first feeble puff of smoke, to the proud delight of their

mighty parents? On all these points the record is barren.

Down in Bermuda, where we catch and study the great black dragonfish that live in the depths of the sea, we are doing our best to learn all we can about the lives of our dragons so that we may do better than did Perseus, St. George, and the rest. The field laboratory of Dr. William Beebe's Department of Tropical Research of the New York Zoological Society is fitted up for just that purpose. It is well supplied with boats and nets, cameras, microscopes and scientific instruments of every kind. But in spite of our excellent equipment, we have one of the most difficult jobs in the world, because we have to be first-rate detectives as well as scientists and fishermen. It is true that we do not have to battle the dragons hand to hand; it is only rarely that we must grasp a struggling fish to keep it from sliding from the edge of the net, just up from a thousand fathoms, back into the water. But we do have no end of trouble acquiring our dragons, nevertheless. The old-fashioned hero heard reports of a

monster's laying waste a particular neighborhood and, after that, the brave man usually had little trouble tracking him down. We know that the sea is full of our kinds of dragons, their brilliant body lights of blue and green, rose and gold, flashing out every instant in the blackness far below our ships. Dr. Beebe saw them again and again from the Bathysphere windows. But our large nets are so pitifully small in comparison with the ocean. Strong though they are, they must go so slowly through the water to keep from being ripped to pieces, and most self-respecting dragonfish with enough wit to have grown successfully to dragonhood have ample time to swim calmly out of reach. So it is only by the merest luck that we catch these fishes at all.

When we are fortunate enough to bring one up alive, we surround him at once with ice, so that in temperature, if not in pressure, his new home will be as much as possible like his familiar ocean depths. Then we rush him back to shore and the laboratory. There in the dark-room we can watch his wonderful display of lights, and can paint, photograph, measure and describe him to our heart's content. We are that much ahead of St. George already!

However, these observations tell us only a fraction of all we want to learn of the sea-dragon. We can easily look into his capacious stomach and find just what other fishes or scarlet shrimps formed his last meal. We can even, by treating him with chemicals, make his black skin and thick muscles quite transparent, and stain his skeleton bright red, so that we can study his bones and, from their shapes and sizes, speculate logically on his ancestry, his immediate relations, and the identity of his nearest shallow-water cousins. But some of the biggest questions still remain: How does he find a mate? What are his babies like? How do they grow?

To the first question we have so far almost no answers, except for one exciting hint, which, only last spring, came

quite literally to light. We found that all male sea-dragons have large, flashing cheek-lights, while the full-grown females usually have none at all. So it is likely that the females are attracted to their mates by these flaming beacons. In one species—the gleaming-tailed sea-dragon, *Idiacanthus*—the adult male is a tiny creature never more than two inches long, while his mate may be twenty inches. The male, as usual, carries a large cheek-light, but almost no other dragonfish paraphernalia. He has no body

lights, no teeth and no stomach, and, while he waits for a female to seek him out, apparently lives on the nourishment stored in his own over-sized liver.

We do know that sea-dragons, like most other fishes, lay eggs that are transparent globules like tiny spheres of glass. Although they are probably liberated deep in the ocean, some of the eggs rise even to the surface before hatching, and the baby sea-dragon bursts out into a world of light, air and abundance of plant food such as the old fish never know. It is a world completely lacking in privacy, and swarming with so many enemies—fishes, shrimps and other sea creatures—that only one or two out of hundreds or thousands ever develop into adult dragonfish.

The infant sea-dragon looks as little as possible like his parents. Human babies have to change a lot before they grow up, but at least we have no difficulty in de-

ciding at the start that they are man-children, and not monkeys, or rabbits, or kangaroos. They have all the arms and legs they are ever going to have; they are furnished with indubitably human fingers and toes; their heads, though large, are at least the right shape, and their eyes, noses and mouths are all in their proper positions. And most babies are more or less the right color almost from the day they are born.

With a sea-dragon it is quite different. Whereas the grown fish are velvety black, with flashing lights, huge mouths full of sabre-sharp fangs, and mighty fins and

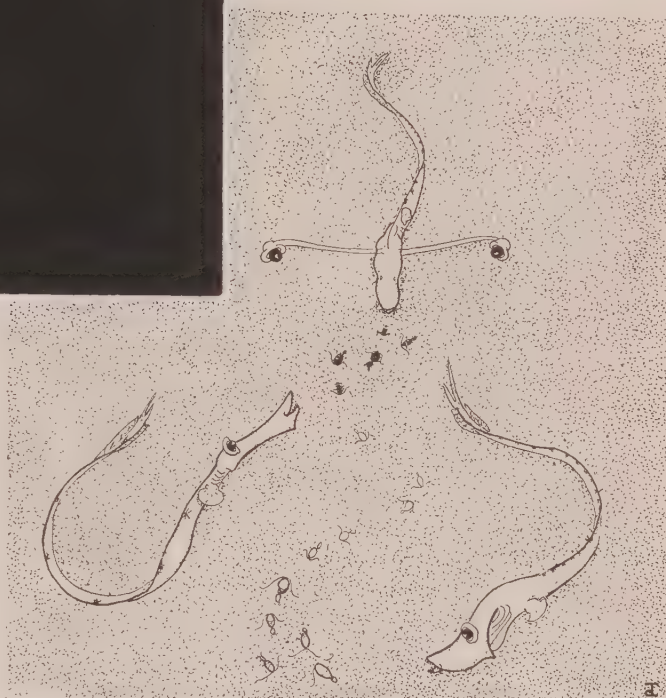


DEEP-SEA DRAGON FISH HAVE NO PARENTAL PRIDE AT ALL AND NEVER EVEN RECOGNIZE THEIR CHILDREN. THE LATTER PASS THEIR BABYHOOD NEAR THE SURFACE, AND, WHEN THEY ARE BIG ENOUGH TO FLASH THEIR FIRST LIGHTS, SINK DOWN TO LIVE AMONG THE GROWN-UPS IN THE DARKNESS. HERE IS *MELANOSTOMIAS SPILORHYNCHUS*, SKETCHED BY THE AUTHOR



A YOUNG DEEP-SEA SHRIMP AND THE LARVA OF THE DRAGONFISH KNOWN AS *IDIACANTHUS*. IT IS INTERESTING TO NOTE THAT BOTH OF THEM HAVE THEIR EYES ON THE ENDS OF LONG STALKS. PHOTOGRAPH FROM WILLIAM BEEBE

BELOW, THE AUTHOR HAS SKETCHED THE DRAGON NURSERY, WHICH IS IN THE "ATTIC OF THE OCEAN". LARVAL DEEP-SEA DRAGONFISH LIVE NEAR THE SURFACE AND ARE FRAGILE, COLORLESS CREATURES LESS THAN AN INCH LONG. THEY FEED ON MICROSCOPIC PLANTS SUCH AS DIATOMS, AND ON TINY CRUSTACEANS. THE LARVAE SHOWN ARE, LEFT TO RIGHT, *EUSTOMIAS*, *IDIACANTHUS* AND *BATHOPHILUS*.



tails to shoot them swiftly through the sea, each infant is absolutely colorless, except for a few grayish freckles here and there. He is so nearly transparent that you can look inside his head and see his almost non-existent brain. There is no sign of a light organ anywhere on his body. He has no fins at all, except for a paddle-like pectoral back of his gills and a transparent frill of membrane that runs around the upper and lower edges of his body. As if to make up for these deficiencies, his eyes are especially large. Instead of being of a normal, fishy roundness looking sidewise, they are elongated top and bottom, and directed forward somewhat like our own. The larva of the gleaming-tailed sea-dragon has the strangest eyes of all. For no reason that we have yet discovered, they are far out on the tips of long stalks.

If a human baby were born with a nose a foot long, his poor mother would doubtless die of embarrassment. (I have forgotten what happened to the mother of the fairy-tale princess when she saw that her daughter's nose was two ells long.) But all baby dragons start life with snouts fully that long in proportion to their bodies, with a tiny mouth stuck out on its tip. Perhaps it is just as well that dragonfish are hampered by no maternal instincts.

That tiny mouth gradually becomes filled with short, slender teeth that correspond to the milk teeth of human children, since at the end of the larval stage the little fish loses them all. Along with long, temporary spikes or "rakers" on the gill-arches, the teeth probably help to strain the tiny plants and animals—diatoms, protozoans and crustaceans—from the water. Thus fed, the larva grows from about one-fifth of an inch in length to an inch or more.

About the time that the teeth and rakers drop out, the

sea-dragon begins to undergo a transformation. His whole skin thickens and darkens, the first faint beginnings of his rows of lights appear, and his various fins emerge and take shape. During this period, lacking teeth and a stomach, he does not grow, and probably does not eat.

Then comes the long period of adolescence, during which he grows big and strong, and begins to look more and more like a true dragon-fish. It is doubtless at this time that he takes to living in deeper water, and is henceforth in danger of being eaten even by his mother and his cousins, his sisters and his aunts. His skin blackens quite suddenly and completely, while his light organs develop lovely violet centers shielded above with tinselly caps of gold. He cuts his second teeth, his snout shortens, his eyes become normally round, and his mouth grows and grows until it is a great, toothy trap with a gape reaching back to the very end of his head. He develops, too, a long, pouch-shaped stomach in which to store his prey whole. With more and more assurance, he chases ever larger prey, beginning in a modest way with young

crustaceans, and later working up to lantern fish and shrimps as large as himself.

How long all this coming-of-age takes we have not the remotest idea. We have never been able to rear baby dragonfish, of course. They are too delicate to stand the journey from the sea to the laboratory. We can only piece the stages together by doing detective work on the catch of young fish of different sizes, along with the much rarer big ones, in our nets. Fortunately, there is still no law requiring that we throw back deep-sea fish under—say—eight inches! The gray freckles on the youngsters' sides and backs are one of our best clues in learning what kind of

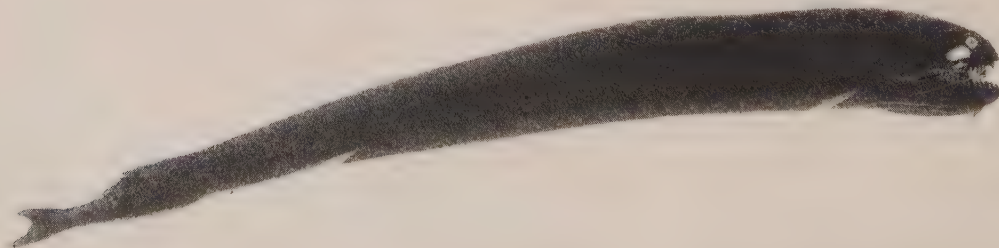
fish a particular larva will grow up to be. This is because traces of the freckles remain after the fish is half-grown and has developed light organs, teeth and proportions that are clearly identical with those of adult dragons of a certain species. Other clues are the number of body segments, and, when they appear, the number of finrays.

One more discovery has been especially interesting. For years small dragonfish of many kinds, some measuring only an inch or two in length, were described as new species because they had barbels under their chins that were different from those of any known form. Although these little creatures had jet black skins, brilliantly colored light organs and all the other external appurtenances of typical, grown-up sea-dragons, we had a surprise in store. When we examined them closely—their teeth and gills, their bones, the length of their stomachs, and the condition of their breeding organs—the truth was clear. They were

actually very young fish of well-known species. The barbels had not yet taken on adult characteristics, and hence the fish seemed to be different. So here they were fooling the world into thinking they were grown-up sea-dragons when, compared with human babies, they had not even reached prep-school age. Apparently it is best for young dragons to win through to the relative safety of an adult external appearance just as soon as possible, and so it is that juvenile dragons swim about all dressed up like mother.

So, little by little, we are learning their secrets. However, until some Merlin of the future can wave his wand and turn us temporarily into dragonfish—so that, for months and years we can do and feel and smell and see all that a deep-sea dragon does—our most impressive scientific discoveries will remain exasperatingly small compared with all the exciting, unsolved mysteries in the sea.

THIS IS *MELANOSTOMIAS*, A FOOT-LONG DRAGON FISH FROM A HALF MILE DOWN. IN LIFE ITS GREAT CHEEK LIGHTS ARE GOLDEN YELLOW AND THE PORTHOLE-LIKE BODY LIGHTS ARE VIOLET. PHOTOGRAPH FROM WILLIAM BEEBE



THIS ADULT SEA-DRAGON *ECHIOSTOMA*, WAS PHOTOGRAPHED WHILE STILL LIVING. THE SMALL FISH ARE ROUND-MOUTHS THAT WERE TAKEN IN THE SAME NET. IN THE DARK ROOM THE PINK CHEEK ORGAN OF THIS FISH FLASHED A BLuish LIGHT BRIGHT ENOUGH TO READ BY, AND THE PURPLE BODY LIGHTS GAVE A ROSY GLOW. THE PHOTOGRAPH, WHICH IS FROM WILLIAM BEEBE, HAS BEEN SLIGHTLY RETOUCED TO SHOW THE LIGHTS



Dooryard Roses

*The story of a man who creates
new and better roses*

By ROMAINÉ B. WARE

MABELLE STEARNS, A PERPETUAL
FLOWERING DOORYARD ROSE
WITH SILVERY PEACH-BLOSSOM-
PINK BLOOMS, DEVELOPED BY
HORVATH

rose, Doubloons, in your garden, you owe a debt of gratitude to him. He is its originator. When its large, deep-yellow blooms grace your grounds in June, and are repeated in July and September, make a bow toward Mr. Horvath. Doubloons represents a milestone in rose progress. But this rose man tells us that there are far better climbers to come. He visions climbing roses that will be winter hardy with little or no protection even where sub-zero winters are the rule. He says it will not be many years before we may grow fine roses without resorting to constant spraying and dusting. If you have struggled with spray and dust, and still have to make many replacements, the future Mr. Horvath predicts cannot come too soon.

Horvath's life has revolved around horticulture. A landscape architect by profession, he spent many years in nursery work and planting. The wonderful Cleveland park system is a monument to his genius because for many years prior to his retirement in 1920, he was in charge of its design and construction. The past twenty years have been spent in experiment at his home in beautiful Lake County, Ohio.

Our garden roses today are almost 100 per cent hybrids. Their lack of hardiness is due largely to the fact that the native stocks from which they developed came from the more temperate sections of the world—South China, western Asia and the Mediterranean regions. All our roses came originally from the wilds. Hundreds of years have elapsed in their change from the usually small single blooms of the wild species into the magnificent specimens we enjoy today.

Among the wild roses of this and other lands there are numerous hardy varieties. All through our northern states, into Canada and even within the Arctic Circle, some wild roses flourish. Why not, Mr. Horvath reasoned, use some

IT was less than a decade ago when I first visited a plantsman, living not far from Cleveland, Ohio, who was not satisfied with the roses he grew in his garden. All too many winter-killed, he mourned, and the dread scourges of blackspot and mildew caused too much havoc among his beloved roses. Climbers had only a short season of bloom, and he wanted to prolong the beauty of their blooming through summer and fall. Also, too few climbers were reliably hardy.

Many gardeners feel like this about their roses. We fuss and complain because our roses disappoint, but rarely does anyone do anything truly constructive to better the situation. This Ohio rose man did. Plants had been his work since boyhood, and he believed better roses could be grown. In fact he had been working to prove this conviction for nearly half a century. And on that fall day nearly ten years ago, he took me into his garden and showed me some of the fruits of his labor.

It may be that you have read of this plantsman—M. H. Horvath. If you have the wonderful new climbing

of these, crossed with desirable garden sorts, and combine the wanted traits of each into quality roses for northern gardens? From a genetic standpoint, this was perfectly practical. After several years of study and experiment, Mr. Horvath selected the species *Rosa setigera* as the one to give the desired hardiness to new garden roses. Native to the prairie states from Ontario to Texas and Florida, it is hardy and thrifty. In gardens it is known as Baltimore Belle and Queen of the Prairie.

Mr. Horvath crossed *Rosa setigera* with *Rosa wichuraiana*, another hardy species, from the Orient. Seedlings of this cross were again crossed with the beautiful pink hybrid tea rose, Lady Alice Stanley, from the seeds of which came a vigorous climbing hybrid pink variety he called Mrs. F. F. Prentiss. It took Mr. Horvath only a few moments to describe this process, but he was ten years at its accomplishment.

In subsequent visits to the garden of this great plantsman, I have seen more of the fruits of his labors. It may well be called labor of love because Mr. Horvath does not expect to make a profit from his work. It is reward enough for him if the rose lovers of the world can enjoy better roses with less difficulty. What money he may receive in royalties from his rose introductions is being put into a trust fund to help establish a national rose-testing garden where new originations from all over the world may be tried out before being offered to the public.

In the Horvath trial plots last summer I saw the beginnings of a new race of bush roses that should equal our much loved but generally difficult hybrid tea roses. Also there were numerous new climbers of wonderful hardiness, and many new dwarfs of the *R. polyantha* type.



HERCULES IS ONE OF THE HORVATH HARDY CLIMBERS WITH A DEEP ROSE-PINK FLOWER AND IS ALMOST DISEASE-RESISTANT

zero in his garden and without any covering. Another, he told me with a twinkle in his eye, he named for a sweetheart of his before marriage, Mrs. M. H. Horvath. These and others of his originations are now offered the public through a prominent nurseryman. Mr. Horvath, personally, does not sell any plants. He is a hybridizer and a creator. His interest lies in producing new and better roses rather than commercial production.

Mr. Horvath is no longer a young man—he was 71 last year—but he showed me some new hybrid understocks with which he plans even greater things for the future. The gleam of youth still lights his eyes as he talks of his much-loved roses, and the fire of achievement urges him on.

Another phase of Mr. Horvath's work with roses has to do with feeding for disease resistance. He has been working along lines similar to those followed by the great French rosarian, M. Mallerin. They have found that rose plants receiving adequate supplies of plant food, especially potash, produce foliage practically disease-resistant. The plants I saw in this Ohio garden during July, 1939, were ample proof of his success. Nearby were check plantings receiving but



THOR IS A GIANT SCARLET CLIMBING ROSE WITH LARGE BLOOMS AND LONG STEMS

ordinary feeding and care, with mildew and blackspot more or less prevalent, while plants in the scientifically-fed beds were practically immune.

Mr. Horvath does not claim that his new roses supplant the magnificent hybrid tea roses used so abundantly in gardens today. He feels, however, that there are many gardeners and home lovers who desire beautiful roses, but who lack the time or the inclination to give the care required by the exacting demands of many present day varieties. On the side of hardiness, Mr. Horvath says, ever so modestly, that the limit for quality roses has moved at least five hundred miles farther north with the advent of these new roses.

Thor, the giant scarlet climbing rose, produces its perfectly-formed flowers on stems twelve to eighteen inches long, and the blossoms average four to five inches across. Its foliage is almost perfect and highly disease-resistant. In a large test planting it suffered no mildew or blackspot during three years, although roses on all sides were badly infected. Thor ultimately grows eight to ten feet high.

Another Horvath climber of similar character, but pure white and very fragrant, is Polaris. Its foliage seems immune to mildew and blackspot.

A third climber developed by this rose genius, and now available, is a brilliant rosy-pink named Federation. It is said to be absolutely mildew-proof and enjoys an extremely long season of bloom.

Imagine a deep rose-pink flower about the same shade as the lovely hybrid tea, Dame Edith Helen; the blossoms fully five to six inches across; the plant growing fourteen to fifteen feet high; the leaves shining bronzy-green and highly immune to disease! This is the Horvath climber called Hercules.

All these climbers are hardy without protection in temperate sections, and may be grown successfully with protection in colder regions where roses heretofore have been impossible, or exceedingly difficult.

If you have despaired of success with hybrid tea roses, you might try Horvath's new perpetual-flowering rose, Sonia. It is a glowing cherry-red with orange center. Extremely rugged, it grows only twenty-four to thirty inches tall, and is ideal for rose beds. As I saw it last summer, its performance under extremely trying conditions was wonderfully satisfying.

Mr. Horvath seeks to supply what he terms dooryard roses—types that are ever-blooming and foolproof.



M. H. HORVATH, ROSE CREATOR, WHO, AT 71, LOOKS FORWARD WITH VIGOR AND ENTHUSIASM TO CREATING NEW ROSES THAT WILL BE HARDY AND LOVELY. THE LITTLE LADY IS A ROSE IN HER OWN RIGHT

Among the first of this group he offers a silvery peach-blossom-pink named Mabelle Stearns. It seldom grows more than two feet high, but, if unchecked, will spread to a bush six to eight feet in diameter. This habit makes it ideal as foreground planting in the shrub border, for a ground cover in low beds, or as a bold mass planting along drives. Being never without bloom from June to frost, delightfully fragrant and long-lasting when cut, Mabelle Stearns should find a hearty welcome.

As I chatted last summer with this amazing rose man in his garden, where almost everything is an experiment, a striving for something better, I thought of what his efforts will mean to so many backyard flower lovers. He has seen the opportunity Nature offers, and rose lovers through the years will benefit from his striving and dreaming. He is happy in the success that has attended his efforts, but he is never satisfied. Always he sees better roses.



THE FLAMINGOS OF THE HIALEAH PARK INFIELD AND THEIR NESTS

The birds, when nesting, shake out their feathers and appear rosier than ever when the gorgeous underlying plumage is exposed. Carmine knees and orange beak add to the pictorial effect

Hialeah's Flamingos Establish a Branch of the Family

By RUTH WOOD THOMPSON

DRIFTING over the greensward in roseate waves, posing in lovely fantastic attitudes on the rim of the pond near the racing strip, the famous flamingos of Hialeah Park have been an integral and decorative factor of the Miami scene ever since their importation from Cuba about eight years ago. They lend a tinge of the tropics to the picture. In February, on next to the last Saturday of the season, the flamingo flock is herded past the stands preceding the running of the Flamingo Stakes.

Always lively attention-getters as one of chief ornaments of the two hundred-acre racing park developed by Joseph E. Widener, they are more than ever in the public eye this year. At the last breeding season, climaxing tedious years of trial and error, hope and frustration, exactly one-half of the flock of two hundred and forty birds achieved parentage. Not one had ever before successfully raised a chick. In founding a North American branch of the flamingo family, known scientifically as *Phoenicopterus ruber*, they set an all-time record bordering on the miraculous.

Sixty eggs were hatched last May. So it happens that sixty yearlings are added starters in the 1940 flamingo cavalcade. Accompanied by their relatives, the first of their species successfully to be produced on the continent

will be formally presented to visiting throngs. At the age of nine months, they are fully clothed in their shining coats of pink, vermillion, cream and black. They are as tall as their fathers and mothers—about three and a half feet from their webbed toes to the tips of their haughty beaks—and they are, if anything, a bit heavier than their parents, due to their voracious eating habits. A young flamingo's appetite is in absurd contrast to the fastidious delicacy of his appearance.

A bulky folder in the files of the Miami Jockey Club is entirely taken up with memoranda and letters relating to the acquisition of the original flock and subsequent additions from Cuba and South America. There are also numerous notations on the care and feeding of the birds, and opinions of scientists expressed pro and con on the possibility of their breeding in captivity. The management looks upon the many hundreds of exotic birds that live on the grounds as timorous wards from another clime. They are cherished as phenomena too lovely, really, to seem true.

A practical regimen has been worked out, covering their requirements, and students of tropical bird life have been consulted as to their food and environment. This applies not only to the four hundred flamingos now in residence, but to other ornamental fowl—to the scarlet



THE FLAMINGOS PARADE BEFORE THE RACE THAT IS NAMED FOR THEM

Heads alert and high, they are a wave of rhythmic color. When the race known as the Flamingo Stakes is held on February 24, this year, sixty American-born birds will join the procession.

ibises that roam the infield; to the black and white swans that add a sturdy contrasting note.

An accident to one of the birds, or any disturbance that may distress them, receives instant attention on the part of Joe Morrow, the ground superintendent, and his staff. What goes on among the flocks is a matter of conversation both in the stables, and among top-ranking officers of the Club.

Losses have been astonishingly few. Occasionally, one of the flamingo colony suffers a broken leg. That is a cause for mourning, because attempts to set the excessively thin long leg bone are never successful. A flamingo with a broken leg usually pines and dies.

Two or three years after the birds were settled at Hialeah Park, a few of them indicated that they wanted to follow the dictates of Nature at breeding time. Their protectors took this as assurance that the conditions provided for them on Florida soil approximated what they were used to in hotter lands. Initial efforts to make nests came to nothing, however, because, it developed, the building materials at hand were not the right mixture. This fault was corrected by providing wet clay and gravel in the spring of 1936. Their caretakers' enterprise and willingness to cooperate with the birds was rewarded by the laying of a single white egg. Only one, but it was of epochal importance, as up to that time no egg had ever been deposited in a flamingo's nest in this part of the world. It was duly reported to learned societies, and recorded in the annals of North American ornithology.

The record-breaking egg was about the size of a goose egg—not as large as one would expect, considering the flamingo's stature. The most noticeable thing about its

appearance was the chalky substance that coated it. Research on the part of those in charge revealed that this was Nature's way of insulating eggs that must lie exposed to broiling tropical sun rays.

Circumstances affecting the strangers became more favorable. They were less tense and shy, and in the spring of 1937 ten times as many nests as before rose on the muddy edge of the pond. It looked like a good flamingo year. But alarming night noises—dogs, marauding raccoons, possibly—upset calculations. Incubators and non-incubators all swarmed for refuge to the center of the shallow pond. And there they stayed. The nests, finished and ready for the egg-laying to proceed, were a total loss. By quick action, three eggs were salvaged, and one of them, mothered by a setting hen, hatched out. That was exciting news indeed. Intensive effort was made to keep the downy white fledgling alive, so that it could grow up to be hailed as the pioneer of a native line. A broth was concocted of clam juice and egg yolk, which compared as nearly as possible with the regurgitated fluid fed by mother flamingos to their young. No luck. The medicine dropper and its contents were ineffective substitutes for natural feeding. After two weeks of pecking and strutting about an empty horse stall, the priceless chick died. They made a glass case to preserve its small form, with a plate suitably inscribed.

The year 1938 showed a complete blank in the birth statistics of the flamingo "city." Conceive, then, the gratification of the watchers haunting the breeding-ground when close to a hundred turrets took shape in the spring of 1939. The precaution had been taken to transfer the flock to a fenced-in island for greater protection during

the incubating period. This move was doubtless responsible for the sensational happenings that followed.

Ninety nests were made, with an egg in nearly every nest. In a month, sixty eggs were hatched. So far as known, not a chick was lost after emerging from the shell.

Both parents took turns in sitting. Twice a day they changed places, early in the morning and late in the afternoon. In taking the flamingo census, it is impossible to tell the males from the females because the two sexes have identical appearance, habits, and general disposition. It is known that mates are monogamous for at least one season. Both father and mother are very much on the job until the young one is reared. One egg to a nest is the rule. Like other wild water fowl, flamingos turn their eggs at frequent intervals by energetic movements of the beak. With their gangling legs straddled across the brim of the nest, they uncoil their serpentine necks and reach the egg.

Nests are ingeniously moulded to meet the various contingencies affecting a flamingo's existence, in captivity as in the wild. The pairs work together, diligently assembling moist clay, pebbles, twigs and other handy debris. They lay a broad foundation to make the structure stable in heavy tropic rains. It is piled as high as available material allows and narrows gradually toward the top. At Hialeah Park, building needs are supplied by trucking in as many loads of marl and gravel as the birds will use. A flamingo is naturally inactive and lazy, and will not go out and hunt material, but adapts to its requirements whatever it finds close at hand.

As the turret rises, the builders mount the foundation and scoop up billfuls of mixture, pile it on the base, and stamp it in position with their strong webbed toes. The diameter of the foundation of nests in the Hialeah community is between 20 and 24 inches; of the top, 14 inches. The average height is about one foot, with a concavity one inch deep in the top.

Rains and floods wash eggs out of this shallow hollow, and they are rarely recovered, although birds have been



THE FIRST NATIVE FLAMINGO

Hatched by a hen in 1937, artificial feeding failed to keep it alive. It is now on display in an appropriately-marked case

reported as using their crooked beaks like a golf club to get lost eggs out of the rough. Nests are built rim to rim, as a protective device against swooping hawks and other enemies that menace the colony of breeders.

When the chick in the egg is due to be hatched, usually after thirty days of sitting, it announces that it is ready to come out by issuing cheeps and shrill chirrups, ludicrously out of keeping with its size. It pecks its own way through the thick shell, usually a twenty-four-hour task, and walks out under its own steam. The chick may be a bit on the wobbly side at first, but it quickly gains the use of its short stubby legs and begins to eat the shell that lately covered it. In a few hours the youngster can swim and run, and all the while it becomes more boisterous—squeaking, crowing, yipping like a new-born puppy. Grown-up birds have a loud coarse honk that can be heard for a long distance.

The babe is independent except at meal times, which

cannot come too often. When mother sounds the dinner bell, it runs as fast as it can. That is quite a sight! At Hialeah last Spring, sixty yipping youngsters hurried to answer the call—tumbling over each other, perhaps in their haste scrambling into wrong nests, and getting well pecked for their pains by the rightful occupants.

A baby finds its mother by its keen sense of smell. At feeding-time, it opens his mouth wide, makes contact with her broad humped beak, and holds on while she brings up the crimson life fluid from her stomach and pours it down her offspring's gullet. When the baby is so full it cannot keep its balance, the mother shuts off the dose. Flamingos grow fast, and change from white to ash-gray and to bright pink-and-cream in a few weeks.

The youngster learns to shuffle and tread its feet on the bottom of pond or stream, like the adults, with its forehead topside down in the mud, and its jaws working like a steam shovel. The bill of the flamingo has a device that serves to strain out mud and foreign matter taken into the mouth together with frogs, insects, water plants, and other tidbits.

(Continued on page 172)



NATCHEZ, MISSISSIPPI, IN 1822, AS PAINTED BY JOHN JAMES AUDUBON

This original hangs over the dining room mantel at historic Melrose and will be exhibited to the public during the Ninth Annual Natchez Pilgrimage to be held from March 24 to April 7

AUDUBON AND NATCHEZ

Annual pilgrimage will honor great naturalist-artist

By EDITH WYATT MOORE

HANGING above the dining room mantel at Melrose, one of the most beautiful and best-preserved of ante-bellum mansions at Natchez, Mississippi, is a painting in oils of the city as it was in 1822. It is the work of John James Audubon, and is one of the rare collection of Audubon originals that will be exhibited during the Ninth Annual Pilgrimage held under the auspices of the Natchez Garden Club from March 24 to April 7. Other works of the great naturalist-artist will be shown at Connelly's Tavern, which has been restored by the Garden Club. This was the place where Aaron Burr and Blennerhassett held secret conclave in 1807.

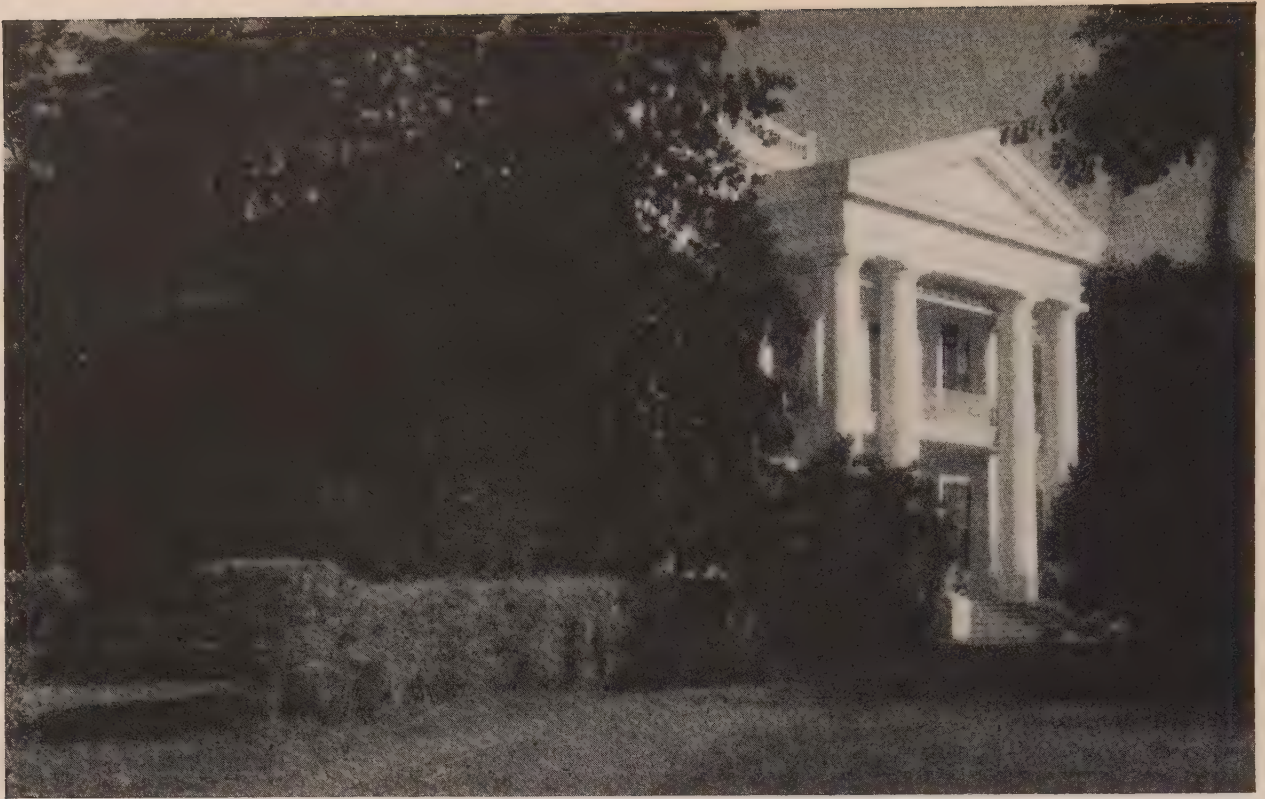
Perhaps less attention has been paid by biographers of Audubon to the years he spent in Natchez than to other periods in his life. It was a time of struggle and poverty, but in this growing southern city this lean, shabby, dark-eyed son of France found some measure of appreciation. It was in 1821 that Audubon and John Mason landed in Natchez, whose cotton planters were enjoying a prosperity that allowed them to indulge an interest in the arts, and which was then becoming a seat of culture.

Audubon offered himself as an art teacher, and one of his first pupils was Melanie Queggles, daughter of a rich Spanish merchant. He was retained by other parents to

give instruction in dancing and drawing, and seems to have enjoyed considerable patronage. One could never be sure, however, when the eccentric artist would appear to give his lesson, for the surrounding thick forests and their teeming bird life had a strong lure for him. Often he would arrive late for appointments, tattered, torn but triumphant after a collecting foray.

Some semblance of a stable existence having been established, Lucy Bakewell Audubon, devoted wife of the naturalist, followed him to Natchez and they took a house in Union Street. Audubon opened a studio there, but it appears that there was no great rush to his door, and he finally obtained employment as art and dancing instructor at Elizabeth Female Academy at Washington, some six miles from Natchez. He enjoyed this because he could walk to his work in the early morning to the accompaniment of bird songs. Audubon seemed, as always, confronted by debts, and often the butcher and baker had to be content with a picture as payment. Frequently he would offer to paint a portrait in exchange for necessities of life, and this aided Audubon's art to gain currency in Natchez.

During Audubon's stay in this Mississippi city his sons Victor and John were enrolled as pupils at Jefferson College, five miles from Natchez. Records of this still



MELROSE, ONE OF THE MANY LOVELY HOMES OPEN DURING THE NATCHEZ PILGRIMAGE

The house grounds and furnishings are practically unchanged since the 1840's. The grounds are patterned after an English park and contain fine specimens of *Camellia japonica*

exist at the college, where Jefferson Davis once attended. However, since Audubon could hardly have paid the tuition, it is believed that he must have served as a member of the faculty to pay for his sons' education.

Visitors to Natchez during the time of the Pilgrimage will be particularly interested in the painting of the early city. It was done for a Mrs. Griffith, but that good lady died before it was completed and her heirs refused to pay the price asked for it. When he moved on, Audubon was forced to leave the canvas with a friend, Mr. Emile Profilet, who sent it to France where it hung in his ancestral home for some years. On a trip to his native land Mr. Profilet decided to bring the painting back to Natchez, and some years later it was sold to Dr. Kelly, father of the present owner, G. M. D. Kelly, who also is owner of Melrose.

The colors of the picture are still good, and several

buildings may be identified, among them the court house, the Episcopal church and the ruins of Fort Rosalie. The dome of the church was blown off during the tornado of 1840.

Among the drawings to be seen at Connelly's Tavern is a pastel head of B. L. C. Wailes, geologist and surveyor, who was a close friend to Audubon and who accompanied him on many of his field trips.

Thus, beside the charm of the old South, the lure of the fascinating homes of the city, the Natchez Pilgrimage, which has now become an institution, offers to those interested in Nature an opportunity to reconstruct a chapter in the strange life of one of America's first and greatest naturalists. In fact, one of the most beautiful tableaux of the Confederate Pageant and Ball during the period of the Pilgrimage shows Audubon acting as the dancing master for the young ladies of Elizabeth Female Academy.

BLESSING

By LALIA MITCHELL THORNTON

There is a recompense for love I miss,
The blue bird's greeting and the south wind's kiss;
The way a willow bends as I go by,
The pledge the brook makes, and the tender sky.
Perchance my claim is not so very strange,
But I am blessed in these—they do not change.



CHUBBY WAS DEFINITELY FAT AND ALSO SOMEWHAT LAZY

He preferred to eat shelled nuts offered to him by hand instead of going to the trouble of shelling them himself. He was one of those born in captivity

Chipmunks in Captivity

By EMILY ALEXOVITS

Photographs courtesy of the Newark Evening News

"I CAN'T be done," naturalists and zoological garden experts had said repeatedly. "Chipmunks live only a short while in captivity and could not be induced to breed."

Nevertheless, I have maintained these charming little animals in my home, in a contented and healthy condition, for a time in excess of that believed to be their natural span of life. Also, I have bred *Tamias striatus*, the species common in the eastern United States.

Chipmunks make ideal pets. They are friendly and will permit some caressing, but do not like to be picked up or held in the hand except for a moment while snatching a few nuts or seeds.

In their natural habitat, chipmunks nest in stone walls or hollow stumps, usually in or near the woods, and live on seeds and nuts, which are stored up in large quantities for winter.

My first chipmunk was acquired while on a fishing trip in northern New Jersey, in the fall of 1923. A handsome specimen scampered across the lawn of a lake-front residence and dashed into a drain pipe laid under a walk. As this was narrow, I was able to imprison him by placing a foot over each end of the pipe. A friend, at my call, brought a long stick, and, having fitted the cuff of my sweater sleeve over one opening of the pipe, it was

easy to induce the little animal to enter the sleeve. He was transferred to a large ventilated tin box and brought home.

Chippie remained my only chipmunk for nearly two years. In 1925, however, when hiking in the Orange Mountains, I saw some chipmunks and decided to capture a mate. A live-trap was set in the vicinity of their rendezvous, baited with nuts and corn. On my return, there sat my prize, and a female, no less, feasting on the remains of the bait. Trap and chipmunk contents went successfully home in a potato sack.

It is a common belief among householders that a mouse can contract its body laterally and slip through a crack. That a chipmunk can do about as well was taught me by June, so named for the month in which she was captured. When the trap was set down she transformed herself, all of a sudden, into a ribbon of fur, and shot out through the wire bars, which were not more than three-quarters of an inch apart. It seems an unbelievable feat, unless one witnesses it. The closed doors and windows of the room prevented her escape, but during a merry three-hour chase she demonstrated that it is easier to catch a chipmunk in a trap, than with hands wrapped in a Turkish towel.

One day in the early spring of the following year June

set up a constant chirping, which I found was a chipmunk's way of announcing that mating-time had arrived. A connecting runway was built between her cage and Chippie's, after the fashion of a closed porch.

Several weeks later I heard sounds resembling the faint crying of newborn puppies, but did not associate them with the chipmunks until the following day, when I discovered four little fur balls that had rolled out of the nest to the floor of the cage. Their tiny mouths were wide open giving the soft puppy cry I had heard. At the same time they were making strenuous efforts to get their breakfast.

June proved an ideal mother except for one grievous fault. Two of her offspring were females, called Lightning and Baby, and two were males, called Chubby and Smarty. As her family began to mature, June showed a preference for Baby, even to the extent of occupying the same sleeping quarters with her—a privilege she denied the other children. The jealousy of the three that had not shared her favor soon became manifest. Then it was necessary to construct a large cage for the youngsters and put the mother in a cage by herself. But Baby was so unpopular with her brothers and sister that I was obliged to return her to her mother.

In due course the little chipmunks grew up, but they did not forget. One day I carelessly released Lightning while June and Baby were out. To prevent a catastrophe I opened a window and permitted June and Baby to escape, and never recovered them.

All these experiences gave me wisdom for the rearing of the next generation. It would not do to breed brother and sister of the same generation, but breeding must be done "in line." Chippie therefore was selected for the father of the second family, his mate this time being his daughter Lightning, the only female available. As a result of this union, he became both father and grandfather of three little patriots who arrived on the Fourth of July. In honor of the day they were named Washington, Lincoln and Betsy Ross.

When born, a chipmunk is practically naked, but the



ALLIGATOR, JERBOA AND PARROT WERE OTHER PETS

The jerboa learned to run the wheel in the chipmunk cage, curling her long tail over her back as she did so

undeveloped fur in the hide plainly shows the stripes by which it is identified.

The baby chipmunks were soon weaned and taking solid food, and even learned to run, three abreast, in the wheel some time before their eyes were opened. Like other animals they differ individually. Smarty, for example, was inquisitive and sought new adventures daily. He was mischievous as well as adventurous, and sometimes overturned his food and water dishes, spilling their contents to attract attention. If this failed he gripped the food tray with his teeth and rattled it against the glass milk container until I let him out. He liked to perform acrobatic feats by running at great speed in his wheel, suddenly clinging tight to the wheel with his claws and turning many revolutions with the wheel until it stopped. Again he would run the wheel, leisurely jumping in and out, keeping it in constant motion.

Naturalists say the life span of chipmunks is three years. Evidently, then, indoor confinement with proper care, plenty of food and a wheel for exercise, is more beneficial to them than the conditions under which they live in their natural haunts. Chippie was taken out of the woods when he was full grown and at least a year old. Aside from being a little stiff from old age, he was in splendid condition when an old grandfather. He lived for ten years. Only once or twice during that long confinement was he ever sick. On those occasions he was doctored with patent medicines put up especially for animals, and readily responded to the treatment. His first and second litters of offspring lived in cages in the house for six years and five years respectively, and, I believe, were in far better condition than their relatives in the woods.

Only one chipmunk cage can be opened at a time as they are very jealous and will attack one another if two or more are released together. I constructed individual cages for them, with wheels, both cages and wheels being original in design. By request I exhibited one of the cages, complete with all its equipment—sleeping house, wheel, ventilator, food and water containers, etc.—at the 1930

meeting of the American Society of Mammalogists, held in the American Museum of Natural History in New York. Many other naturalists were thus enabled to profit by my experience in developing a simple yet suitable cage for small mammals.

Every day the chipmunks were given a liberal allowance of hickory, hazel and almond nuts, sunflower and hemp seeds and acorns. Occasionally they ate a little fruit but did not care much for it. They showed great fondness for cherry pits and apple seeds, also fresh water and diluted condensed milk, which they drank in preference to the water and liked either sweet or sour. Hard-shelled nuts are necessary for the preservation of their teeth. Chipmunks are clean and odorless, and every day the soft little bodies receive a thorough cleansing from the tip of the nose to the end of the tail. After the morning toilet comes the bed-making, when they rearrange the silk and wool rags, sometimes pulling out every piece as if to give

it a good airing. Next all the nut shells are gathered together, and for want of a better place are deposited at the side of the house or behind it—always out of sight when possible. They arrange the ventilators in their cages by the temperature, stuffing rags over them if it is cold.

The call of the chipmunk is a shrill, sharp chirp. In the mating season the female keeps this up incessantly during the day and sometimes far into the night. Otherwise these little creatures make no sound except for an occasional chirp to voice impatience if there is a delay in serving rations, or they consider that too much attention is being given to a neighbor.

They are intelligent and can discriminate instantly between master and stranger. They will not bite a stranger but will pounce at him rudely, as though to say, "Who are you? You don't belong here!" As pets, chipmunks are as interesting and easily cared for as any, and I know of none that are really more thoroughly satisfactory.

The Rare Rose-Root

By WARREN C. WILSON

HERE and there in New York State, in the crevices and crannies of moist cliffs, the rare rose-root, *Sedum roseum*, grows unmolested. This member of the Crassulaceae looks rather like our common live-for-ever, *S. telephium*, the leaves of which children frequently blow up into miniature balloons. The rose-root plants are usually about a foot tall and bear small heads of greenish-yellow flowers. The leaves are a very light green, almost gray in hue. All in all, the plants are far from showy.

The rose-root is one of our rarest wildlings, occurring in New York only on limy cliffs. In the far north and sub-arctic regions it is much more abundant. I have found it at Chittenango Falls State Park and Watkins Glen State Park. At the latter place it grows within a few feet of a



LEAF AND FLOWER OF ROSE-ROOT

A plant of this rare wildling growing from a cliff in Watkins Glen State Park, New York



path that is used by thousands of persons every year; probably few, if any, know that it grows there. I searched for some time before locating the few plants that still flourish on the dripping ledges. I thought that, because of its rarity, the rose-root must necessarily grow far up on the face of the gorge walls. Even binoculars were used in trying to locate it! At both places there are relatively few plants persisting, although the botanical records make one think it is still common. The books also list it as growing on the large rock masses at the Delaware Water Gap.

The New Zealand Fantail

By EDITH M. LAING

AMONG the interesting stamps in a recent pictorial series issued by New Zealand, there are several showing native birds. The one illustrated is the papeda fantail, greatly beloved and regarded by New Zealanders as the darling of the bush. It is brown, with a little black above, and white beneath, and is fond of spreading fanwise its beautiful brown and white tail of twelve feathers. It is further blest with a confiding and friendly nature. It is known to science as *Rhipidura flabellifera*.

One of the delights of "tramping" in New Zealand (and it is a country devoted to that pastime) is that, upon entering the bush, one is almost sure to be greeted by the fascinating little fantail joyfully flitting about the fern-bordered track. It is widely distributed in New Zealand, and is confined to that group. Not many insects escape the lightning darts of this plump little fly-catcher.

How good for the exalted egos of moderns to learn that a primitive people, the early Maoris, realized the necessity of observing closed seasons when the spearing and snaring of birds were prohibited! In this way they con-

served a valuable food supply. When Captain Cook visited New Zealand in 1769 he reported that the number of birds was incredible. The coming of the white man and his settlements rapidly changed this condition. Indeed, some species suffered extinction, but happily the fantail was not among that number. Fortunately, the Government is now well aware that the birds control insect pests, distribute the seeds of valuable plants, and assist in the pollination of forest-tree flowers, and that wisdom demands their protection.

Surrounding the charming little fantail on the stamp are ornamental sprays of the native clematis. Of all New Zealand's wealth of climbing plants, none is more handsome than this beautiful vine of the order Ranunculaceae. In spring it flings its garlands of white, starry blossoms over the tree-tops along the outskirts of the bush. When mingled with the crimson flowers of the climbing rata, against the background of sombre greenery, the effect makes one of the most entrancing pictures painted by Nature for the delight of mankind.

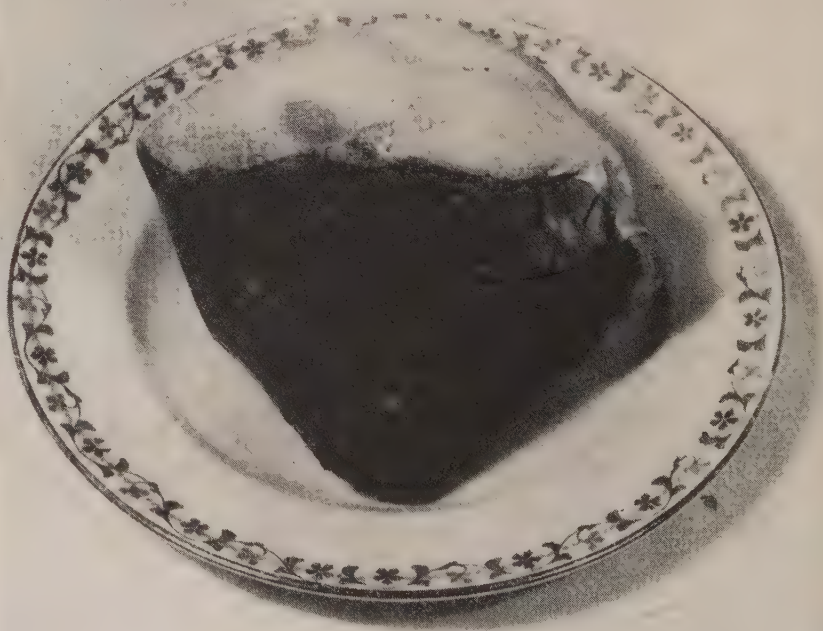


Tough on Teeth

By MARGARET WHITTEMORE

THIS prehistoric "chocolate pie," which is really a peculiarly shaped piece of flint rock, was picked up on the beach at Escanaba, Mich., a lake port town on the northwest corner of Lake Michigan, by Dr. Charles M. Sheldon, author of *My Steps*.

The collecting of rocks and fossils has been a hobby with Dr. Sheldon for many years, until now he claims to have one of the largest private collections, if not the largest, in existence. Near Petoskey, Mich., he has found many marine corals, called "petoskies." One of these corals, picked up in the summer of 1937, has been identified as *Acorvularia davidsoni*, of the Devonian Age, and dating back some 350,000,000 years.



Dr. Sheldon's assortment of amber, secured on various trips in foreign countries, is particularly beautiful. But any such hobby may produce oddity as well as beauty.



KILLDEER OF THE RAILS

Photographs from the

Canadian National Railways

For three years in a row a killdeer has nested in the Winnipeg yard of the Canadian National Railways and successfully reared a family amid the clatter of shifting trains. The iron monsters snorting over the rails around her nesting site fail to ruffle her composure while she cares for the eggs that blend into her nest of pebbles. Yardmen provide occasional janitor and guard service, have supplied a small ring of stones to protect the nest, and have gained a degree of friendship

with the mother bird. However, other intruders are treated to the usual killdeer antics.

Mother Killdeer's first resort is to imitation of injury with trailing wing and fluttering departure from the region of the nest. Failing in this ruse, she valiantly charges—wings spread—with a scolding chatter. In deference to her concern for her eggs or young, the visitor discreetly withdraws.

Beside having an active interest in the annual killdeer family, perhaps the yardmen recall an old European belief that whoever disturbs the nest of a plover will suffer a broken arm or leg. It is rather easy to do this around railroad trains and the yardmen are taking no chances. In fact, they cherish the thought that getting on the good side of the bird may serve as insurance against injury.



FRESH-WATER SHELLS

By ROBERT G. WASHBURN

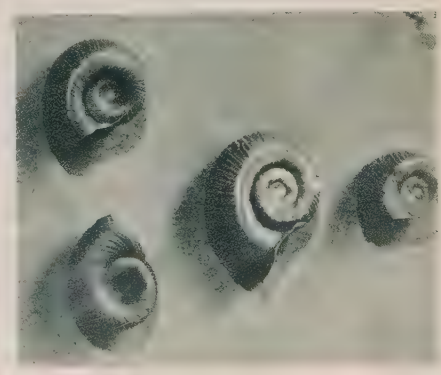
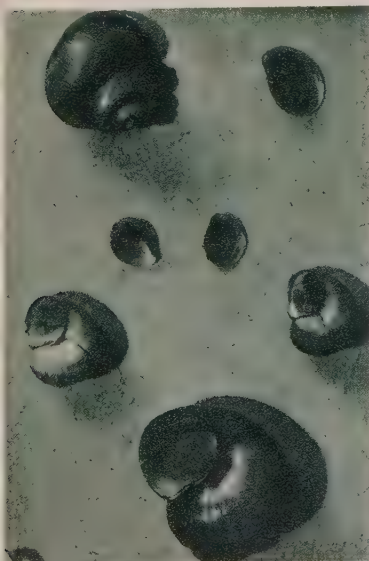
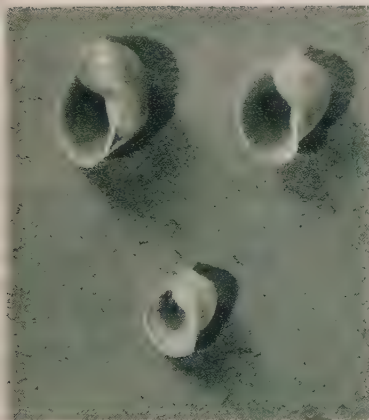
The collection and identification of shells on our sea-coast is a popular hobby and particularly in southern waters where shells of many beautiful forms and colors are easily to be found. Inland, however, conchology has interested comparatively few enthusiasts. So the average Nature lover knows little about the many beautiful specimens to be gathered in fresh-water river or lake.

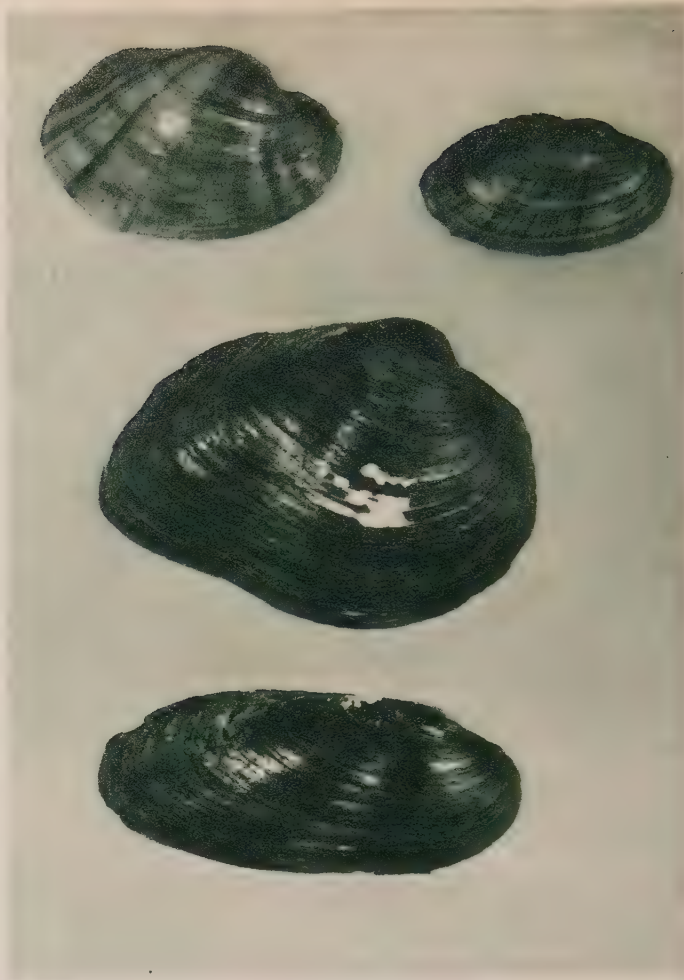
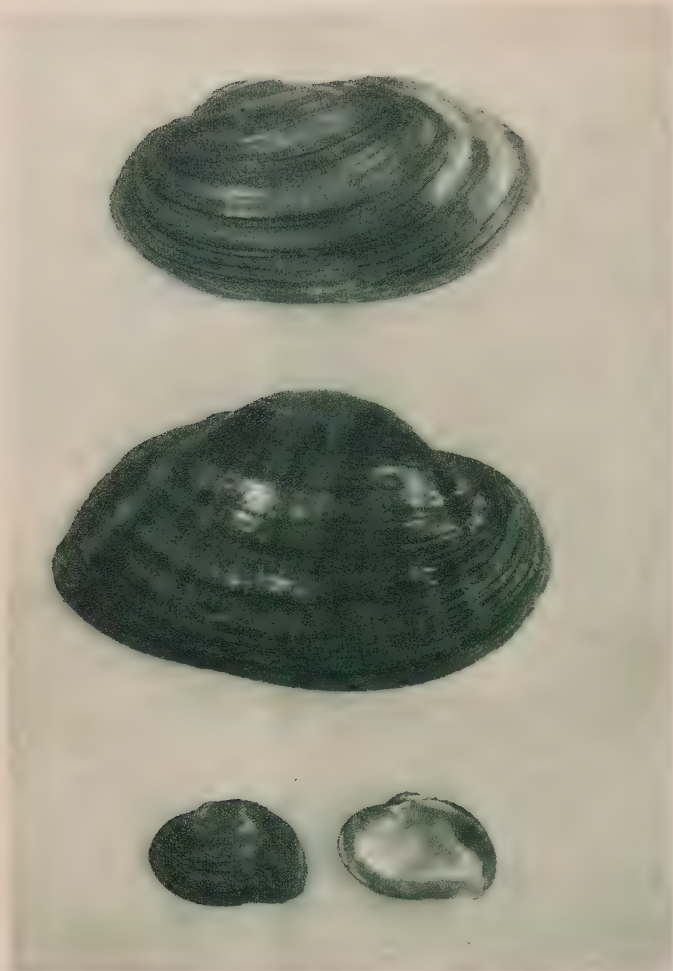
The fresh-water mollusca may be divided into two great families: the bivalves, which include the clams and mussels, and the single-shelled animals, which include the snails and limpets. The bivalves are to be found on the bottom of any river or lake where the mud is not so finely divided as to clog the gills and interfere with respiration. They are also found in rocky places, but usually only where the rocks are small and there is sufficient space for the animal to burrow down between the stones and secure a foothold. The largest and most beautifully-colored specimens are found in the larger rivers. In the inland lakes the clams are not so numerous either as individuals or species, and are, as a rule, smaller, with thinner and more fragile shells.

The clam is sluggish, remaining within a limited area for life. In order that these animals may attain a wide distribution, Nature has provided an interesting reproductive mechanism. The eggs, which are produced in enormous numbers, are incubated in the gills and emerge as free-swimming glochidia. These tiny creatures float about freely for a short time. By means of hook-like appendages, a few succeed in attaching themselves to the body of a passing fish. Those that do not secure anchorage on a fish soon fall to the bottom and die or are eaten. In time, the young clam, having developed a pair of shells, drops from its host to the bottom and begins an independent existence.

Bivalves range in size from hardly larger than a pea to large clams measuring eight to ten inches in the longest dimension. The most attractive feature of the clam lies in the coloring of the inside of the shell. This mother of pearl, or nacre, as it is called, may be pure white, pink, salmon-colored, pale blue, dark-purple, or there may be a play of colors. The pure white shells have found commer-

In the left column reading from top to bottom we have *Pleurocera acuta tracta*, a common river snail from rapidly-flowing rocky streams; *Lymnaea palustris*, a snail found in stagnant pools; *Physa laphami*, found only in the region of northern Wisconsin; *Vivipara contectoides*, the Potomac snail. In the right-hand column from top to bottom *Campeloma rufum*, common in small streams; *Lymnaea stagnalis*, common pond snail found in stagnant water; *Helisoma trivolvis*, another common pond snail.





The top shell in the picture at the left is from *Anodonta footiana*, an inland lake clam; the middle shell is *Alasmidonta marginata*, a clam of the Crawfish River, central Wisconsin; the lower shells from *Alasmidonta calceolus*, a small clam from small streams. At the right, top, are *Lampsilis siliquioidea* and *L. iris*; middle, *Fusconaia flava* and, bottom, *Ligumia rectus*, all clams. Below is *Bulinnaea megasoma*, a pond snail from northern Michigan.

cial use, the heavier shells being cut up into pearl buttons.

The fresh-water snails may be roughly divided into two groups, the air-breathers and the water-breathers. The air-breathers, or Pulmonata, include the large group of pond snails that live in more or less stagnant water. These snails are all egg-layers and both sexes are represented in the same individual. The spiral in the majority of the snails is twisted to the right.

The Pulmonata, mostly rather drab in color, are generally inhabitants of still water in ponds and pools and along the margins of the smaller lakes and rivers where the water is not much disturbed. They favor weedy pools, for these snails are vegetarians. The empty shells are abundant along the shore lines of lakes and rivers, but to find the living animals one must search the weeds and bottom at various depths.

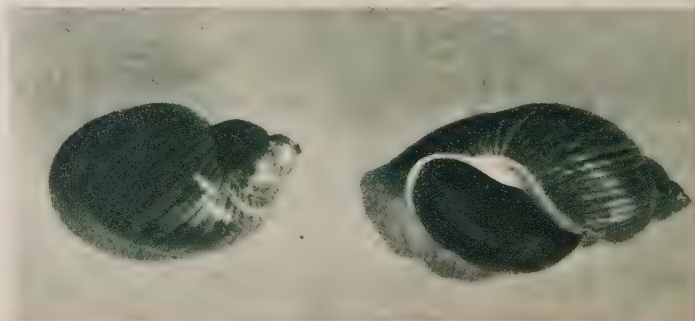
The water-breathers, or Ctenobranchiata, are furnished with gills instead of a lung and obtain their oxygen directly from the water, as do the fish and clams. In this group the sexes are separate and the shell is furnished with an operculum, which closes the aperture when the animal is disturbed. Many of the snails of this order are egg-layers, but a few are live-bearing, the young being carried in the body of the female until they are sufficiently developed to shift for themselves. These water-breathing snails are largely inhabitants of run-

ning water, although a few are found in the lakes. The Ctenobranchiata are found more on the rocks and in the mud at the bottom of rapidly-flowing streams than in the weeds.

Snails have an economic value, forming an important item in the food supply of fresh-water fishes and water birds. Our extensive beds of limestone are made up largely of the disintegrated shells of long-extinct species of mollusca.

Fresh-water aquaria furnish a handy laboratory for the study of the fresh-water mollusca. Most of the common species of snails may be raised in a home aquarium, and their habits and life history can be easily observed.

To the Nature lover looking for a new interest in the outdoors, a study of the shells of his neighborhood offers a fascinating pastime and a chance to add to our rather limited knowledge of this branch of natural history.





The mountain goat that posed so helpfully after an earlier meeting when no camera was handy; and the mule deer that come down to the station for supper. Below, the fence rails make happy landing places for young robins.

LIFE ON A PRIMITIVE AREA

By ELIZABETH T. GAFFNEY

Our nearest road is forty miles away and it is a dirt road, at that. But there never seems to be time enough to visit all the places we wish and to see all the things we would like to see. This is the way of life in a primitive area that has been set aside to preserve the wilderness and all that it holds. My husband's work is that of a ranger in this region of unspoiled outdoors in the Big Prairie District in the Flathead National Forest of Montana.

Although we are far from so-called civilization, we have a great many visitors. They do not occupy the spare beds, or create any problem at mealtimes. Some are shy; some bold. All are interesting, which is something that cannot always be said of human society. These are wild visitors.

An excited series of puppy barks come across the yard from the office - warehouse - kitchen

building. It is Dick Johnson, the black pup, looking in surprise at the young doe that will not run from his barking like the squirrels. Back and forth they jockey until the pup is tired of the game and the doe resumes her search for salty things around the kitchen door.

Nearby, at the salt lick in the pasture, are more deer—does and a young buck, his horns still in the velvet. Elk, though more plentiful than deer in this region, are more shy and must be watched through binoculars.

When no deer or elk are at hand, gay little pine squirrels scamper along the fence rails, which also serve as landing places for young robins. Around the cabin robins, bluebirds and swifts raise their families. In the willows near the slough are more nests, and on the gravel flat near the river I come upon the eggs of a nighthawk. Not far from the





In the pasture among the pines and a young bear that came hopefully for food and found some delicacy in the garbage pail. Below, a view of the mountains through the gnarled limbs of the white-barked pine

buildings I just escape stepping on the young of Franklin's grouse that "froze" at my approach. Robins and warblers sing among the lodgepole pines all day. A killdeer calls from the slough, and toward evening the vireo mingles liquid melody with the call of the wren and against the sound of nighthawks zooming in nose-dives. Late July brings a crowd of pine siskins that bend the stems of the dandelions as they feed on the seeds.

Morning often reveals that a bear has visited during the night. I hear a clatter in the yard and, at the kitchen door, a yearling bear looks inquiringly in at me. Getting no response from me he waddles off to the upturned garbage pail for a delicacy, and finally departs.

Rambles across the gravelly flats by the river, where trout abound, are a delight to me and to the pup, for there he finds gophers a'plenty to chase, and their holes to stick his nose into. Or in the pasture, among the pines, he suddenly scampers off, tumbling over fallen trees, yapping merrily at a chattering pine squirrel, who finally taunts him from a limb overhead. His is the spirit of the chase, but not that of the hunt.

I always look forward to our trips to lookouts, not only for the thrill of being on high peaks commanding views of miles and miles of mountains on all sides, but also for the friendliness of the little striped rock squirrels. There are always several around, scampering in and out of the house, looking for crumbs, taking pieces of hot cakes and raisins from one's hand.

Perhaps my most amazing adventure started out to be a get-acquainted ramble over the rocks of a peak new to me. I had met my friends the striped





That lovely member of the lily family, the bear grass, and a Franklin grouse that, surprised, flushed into a tree. Below, a trip into the high peaks in mid-June is a reminder of the winter

rock squirrels, had seen little rosy finches flying about, and had admired the red rocks with their greenish cover of lichens, and the gnarled artistic limbs of the white barked pine. Coming around a large rock, I found myself face to face with a mountain goat only ten or fifteen feet away. And I had left my camera up in the lookout house! The goat looked astonished, as they always seem to; and I'm sure I did. While I considered leaving to get my camera, a clear whistle sounded above. It puzzled me, for neither the lookout nor my husband was in sight. Again came the clear whistle, again and again, as if to say, "find me if you can." Then, on the gray rocks near the house I spied the whistler, a mountain marmot, who, the next morning obligingly posed for me before taking a nap in the sun. He had scuttled into a crevice among the rocks at my approach, but emerged several minutes later, assured that my little black box and I would do him no harm. The goat, with others, came up to the house toward evening, as they do on several of the high peaks, and I took my pictures through the open window!

There are always highlights of our rides over dusty trails in the valley and to the lookout station on the high peak.

From spring through the short summer there is rapid succession of brightly-flowering plants, giving us whole hillsides of blue pentstemon or magenta-violet astragalus, gravel flats brilliant with yellow eriogonum, patches of blue lupine among the pines. The short fall brings the gold of the larches and the yellow of cottonwoods and aspens. Then winter comes with its snows, the bare deciduous trees and the dark evergreens against the white.

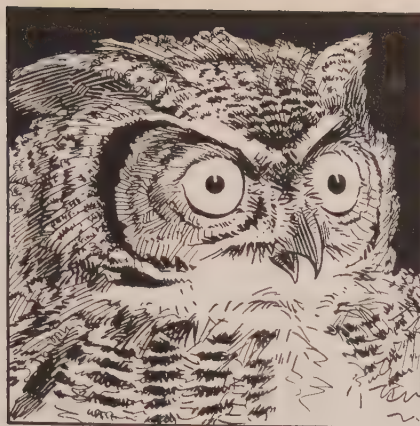




South fork of the Flathead River; here are trout in abundance. Trips to the lookout station in the primitive area are always filled with thrills at new scenes and are certain to result in acquaintance with more birds, mammals and flowers of the region



As We



See It

WOOD VS. WOODS ★

Word comes from Oregon that the Mt. Hood area is being discussed as the next National Forest region to be set aside as a National Park and thus transferred from the jurisdiction of Secretary Wallace's United States Forest Service to the "conservation" empire of Secretary Ickes. If such a move should actually eventuate, it could be accomplished in two ways. Either Congress could pass a bill creating a Cascade Mountains National Park, or the President of the United States could proclaim the area as a National Monument, thus automatically transferring it to the jurisdiction of the Department of the Interior, as has been done within the past few years with a number of recreational and semi-historical areas in the Southwest. Graduation of National Monuments to become National Parks is simply a further step that would naturally follow whenever the area was adjudged to be of sufficient size and recreational importance to justify National Park status.

We are all supporters of our National Park system and of the benefits it has conferred upon the American people. We can readily understand that the administration of exclusively scenic, scientific and recreational areas naturally belongs under the jurisdiction of the Park Service in the Department of the Interior, whose business it is to conserve and to set a reasonable limit upon recreational development for the public use. The important factor, however, is to consider whether more and more forest areas should be dedicated exclusively to the kind of "conservation" that strictly limits use to scenic and recreational values and locks up the timber and wildlife forever from supplying certain practical needs of mankind. We lovers of Nature have been holding the torch for protection of forests and wildlife against commercial despoliation, against the greed of lumbermen and the shortsightedness of sportsmen who often tend to kill the goose that lays for them the golden egg, and thus deprive not only Nature lovers but themselves of future "game". But, had we the power to do so, would we go so far as to decree that no more logs shall be brought to the mill, or that the sport of hunting should be completely abolished? Were we to do this, what answer could we give to the hundreds of thousands of men and women who now derive their livelihood from logging, lumbering and paper-making and

would be forced upon the list of unemployed? What of the seasonal business dependent upon the sportsmen?

All of this must be considered with respect to any large region that may be in line for transfer to National Park status, such as the Cascade Mountains of our Pacific Northwest. The talk about making a park of Mt. Hood is said to be part of an even larger scheme—an attempt to create a great chain of parks from the Canadian border to northern California, of which Mt. Rainier and Crater Lake Parks already form the basis.

West Coast newspapers already have entered the fight. Interests closely allied with the Parks see in such a move an opportunity for expansion, envisioning skyline roads and trails—much money to be spent for recreational development. Lumbering interests, looking to National Forest timber for the permanent maintenance of the wood and paper industries on the sustained yield basis, which they all know must eventually come, bitterly oppose the locking up of resources in National Park status. And, curiously enough, the recreational interests are divided in their allegiance. Some of the ski-clubs and winter sports groups fear lest administration by the Park Service might preclude the cutting of timber for construction of ski jumps—as is now the policy at Crater Lake. Others point to the encouragement given to winter sports by the authorities at Mt. Rainier. Owners of private cabins and lodges in the National Forests tremble lest their fate be that of similar owners in the Olympic Park who were given only a short time to evacuate after transfer from the Forest Service to the Park Service took place. Sportsmen, for whom the forests of the Cascades have long been a hunter's paradise, hold up their hands in horror at the prospect of more National Parks from which their guns are excluded.

Behind it all stalks the spectre of the old, bitter war between two federal government departments. "Reorganization" gave to Secretary Ickes almost all his heart's desire—but not quite. It did not give him the Forest Service. On March 21, 1939, the President wrote to Senator Pittman: "In regard to the Forestry Bureau, I have no hesitation in telling you that I have no thought of transferring it to the Interior Department." Then in transmitting to Congress last May Reorganization Order No. 2, he said: "In so far as crops, including tree crops,

are involved, there is something to be said for their retention in the Department of Agriculture. *But where lands are to be kept for the primary purpose of recreation and permanent public use and conservation, they fall more logically into the Department of the Interior.*" There lies the rub, and quite possibly the root, of this new agitation for a great system of parks for the Cascades. All that Mr. Ickes and his friends have to do is to set up a reasonable claim to the predominantly recreational value of any National Forest areas, and right then they may be taken from under Mr. Wallace's forest empire and added to the domain of the Interior Department. Mr. Ickes was thwarted in his ambition to take over the Forest Service as a whole, but the door was left wide open for him to swallow as much of the forests as he could claim to digest. Forestry leaders like the Honorable Gifford Pinchot are still importuning the President to stick by his March statement to Senator Pittman, but actually these leaders now appear to be adding locks to the barn's front door while the horses are one by one spirited out the back.

It is regrettable that means have not been found to attack the issue of Wood versus Woods on a sane and practical basis. Instead of constant small territorial bickerings between the two federal departments, there should be set up a fair joint commission made up of respected leaders in conservation and appointed by the President or by Congress. This commission should be given authority

and funds to make an impartial survey of the whole public lands problem—National Forests, National Parks and certain other classes of federal lands—to determine, subject to periodical reconsideration, the best use and classification of these lands for the public good. The commission should hold impartial hearings to determine the local and regional economic problems involved, such as lumbering and employment, and act as judge between the forces of selfish interest and the greatest good to the greatest number of American citizens. Recommendations by the commission should be submitted to Congress and should include the right to recommend the creation of new designations of public lands, which might be partly or wholly limited as to use and development. For example, certain areas might be designated as restricted against lumbering, but not against hunting. Other areas might be designated as permanent wilderness, exempt from roads and all recreational development except limited trails and hikers' shelters. We need an honest study of our whole problem of wilderness on the one hand as opposed to every degree of exploitation—whether that exploitation be lumbering, water and power development, or merely roads, hotels and ski-jumps. This problem must not be left to be decided by piece-meal jealous bickerings of two federal departments. The time to set up such a commission is before the agitation in the Cascades becomes another "battle of the Olympics."—ARTHUR NEWTON PACK

MORE ON DUCKS UNLIMITED ★ ★

Since the appearance of Nature Magazine's article on "Ducks Unlimited" in the November, 1939, number, our latest on this subject, some protesting letters have come, mainly from California. In general, these evade the main issue, and accuse the editors merely of ignorance or malice.

One of our objections to Ducks Unlimited lies in its tendency, and that of its mother organization, More Game Birds in America, to encourage and disseminate propaganda that ignores all biological consideration of the subject, assumes credit for greatly improved shooting conditions that are mostly imaginary, and which studiously avoids all reference to governmental or private efforts to preserve our great natural resource, the waterfowl.

In this questionable effort, exceptional advantages of publication are enjoyed by various individuals who are interested in the exploitation of waterfowl for sport or financial profit, and who, to gain their purpose, seem willing to ignore all pretense to honesty and fair-mindedness.

We are sorry to see just such an article appear in the *AMERICAN LEGION MAGAZINE* for January, 1940. Here are four pages on waterfowl production, with illustrations, based on the theory that a tremendous increase of waterfowl has resulted from the efforts of More Game Birds and Ducks Unlimited since 1934.

In all of these pages there is not a word about the 1916 Migratory Bird Treaty with Canada, the 1918 Treaty Act,

and Canada's corresponding legislation, and their subsequent work, or the Biological Survey, or of its efforts and its accomplishments. The paragraph that comes nearest to touching these important subjects is worth quoting.

"More Game Birds in America was one of the organizations instrumental in getting the 'duck stamp' act passed. That has produced nearly three and one-half million dollars, not counting the 1939 sales, since 1934. The President's Committee on Wild Life Restoration was asked for an eventual \$25,000,000 for refuges, and had allotted \$23,000,000 from emergency relief funds up to last September. In the United States there are now 136 refuges primarily for migratory waterfowl. They cover 1,611,711 acres. Hundreds of 'duckports' have been built in recent years by private citizens, gunning clubs, service organizations, municipalities and States. The foundation aids with instructions in creating these smaller refuges and awards annual trophies for achievements."

The plausibility of articles such as this naturally leads to their being accepted as the truth by millions of uninformed citizens, including many sportsmen of the gullible type who get their conservation from gunners' special literature and from popular magazines. And when those who are aware of the real facts venture to criticize, what a torrent of outraged innocence is turned loose! Having little or no interest in the perpetuation of the resource, and no real knowledge of conditions beyond their own limited bailiwicks, these defenders of their sport seem to assume that the non-shooting public is bound to accept as truth all such propaganda, and keep quiet.



CACTUS AS A DOWNY YOUTH

The young burrowing owl photographed by the Craighead boys before they sent him to their cousin in the East



CACTUS IS NOW GROWN UP

Pinfeathers developed into dusty-brown plumage; beak and talons grew long and sharp; wings grew to a spread of almost two feet

Cactus Was Not A Cactus

A western burrowing owl comes East to live

By BARBARA GAWTHROP

THE morning's mail dropped through the slot in the door—a magazine, an advertisement, a letter for me!

After a few words of greeting it said: "If we have an opportunity while we are out West, we will send Cactus to your camp, and you may take care of him. Feed him small bits of raw meat from your fingers. Also give him mice, grasshoppers, and other insects, and every time you feed him give a certain whistle so he will learn to know you." The letter was from two cousins of mine who are much interested in birds.

In another week I found myself enjoying the routine of camp life. Then one day, as I trudged up the hill to my cabin, a friend shouted, "Cactus is here! He's up in the dining hall." I ran to the lodge where, from behind the piano, popped the fuzzy head of a western burrowing owl. Then emerged the whole form of a downy little body with big, bright eyes and long, straight legs. I could hardly speak, but Cactus greeted me with a short, rattle-like squawk. He had come from the far West to Washington, D. C., and from there to Maine, and seemed glad to have arrived.

As time went on the small pinfeathers developed into

dusty-brown feathers, with dull, white spots on them. Cactus's beak and talons grew long and sharp; the small stubby wings grew to a spread of almost two feet, with long, spotted feathers. He soon learned to recognize my whistle, for it meant "food," and he was usually ready for this at any time. Soon he learned to fly—first from my bed down to the floor, later from bed to bed, and, finally, after much practice, from the floor up to the bed.

One day he flew from the ground to the top of the cabin. This somewhat frightened me for he seemed to have been losing his attentiveness to my whistle. But he enjoyed running around on the roof, and stretching his wings for a sunbath, and only after about an hour's fun, he flew down, landing in a heap. Such a height was a new experience.

The warm summer days passed, camp being made even more enjoyable because I had been the "caretaker" of Cactus. Then came a letter from my cousins saying that he was mine. So I could take him home to Kennett Square, Pennsylvania. He stood the trip well, even with the company of a two-months-old 'coon cat, who continually wanted to "share" his meat with him. A splendid

home was awaiting him—a large outdoor cage that had housed my five pet chipmunks. The cage, about six or seven feet long, had two hollow logs, one placed vertically, the other horizontally. Cactus chose the horizontal one for his "bedroom". My father put an insulated box at the end of the log, so that the owl would have a warm place to stay during the cold, winter months. Around this box I heaped leaves, making a more picturesque home.

As Cactus became accustomed to his new home, I began to bring him into the house when I fed him. Starting with my bedroom, he gradually learned about the house and finally that the refrigerator was where his meat was kept. Once, when I opened the door of the refrigerator, he jumped in and grabbed his meat, scolding me when I tried to take it from him.

One day when I was getting Cactus's meat from the refrigerator I heard a series of strange noises. On the kitchen table, sunk into soft butter halfway up his legs, was Cactus! I laughed so loud that it must have frightened the owl, for he jumped straight up, landed in the dishpan full of hot water and soap suds, and then headed for the dining room, dripping water, soap suds, and butter all the way.

By spring Cactus had learned to respond instantly to my whistle. Summer found him with us at our cottage in the Pocono Mountains, traveling with us, by automobile, in a special carrying box. He was free to fly about the yard and woods, but because of several hunting dogs in the neighborhood, I felt that I had to keep a good watch on him. Then one day I saw him fly after a dog, jump on its back, and ride it out of the yard. After this, I was sure he could take care of himself.

Rainy days at Pocono were spent in the house, and one evening Cactus upset things for certain. We were at the supper table, when suddenly I felt some needle-like talons on my head. Then, quick as a flash, Cactus was on the table and into the strawberry jam on Mother's butterplate. Just as quickly he disappeared into the next room. He had gotten what he thought was a piece of meat.

We all went out that evening and when we returned, Cactus was nowhere to be seen. I had not searched far before I found a heap of paper in the kitchen doorway, then one torn piece of paper after another. In a corner, standing proudly upon some paper, gripping in one foot a sticky strawberry, was Cactus. I had taken it from him after his raid, wrapped it in paper, and put it in a waste box. There he found it.

Back at school in the fall, my teacher said I could bring Cactus to school to do his tricks as my part of the "hobby talks" in class. So, in his box, Cactus went to school, while in one hand I nervously clenched some meat, hoping that my pet owl would do what I wanted him to do. After an explanation of my hobby, I walked to his box and gave a soft whistle. The leaves rustled



THE AUTHOR TALKS TO CACTUS

He learned to come at her whistle, got into much mischief but proved to be one of the most interesting pets one could have

vigorously, and out rushed a hungry owl, bringing most of the leaves out with him. With his soft, brown feathers fluffed out, Cactus raced around the schoolroom. He jumped on desks, gave a hungry squawk, and then ran to the nearest hand looking for food. He seemed very much at home. I whistled, and the show was on.

First Cactus grabbed his piece of meat from the back of my hand high in the air. This he did over and over again without once missing, each time clutching the meat in his talons. His next trick was to obtain the meat from underneath my hand. To do this, Cactus had to turn upside down, grab with his feet, and right himself before he landed on the floor. This also was a success. Then I held him high in the air and dropped a piece of meat directly beneath him. Immediately, with wings closed, he let himself fall from my hand to land on top of the meat. It was a well-fed little owl that I put into the box to take home after his first public performance.

Have you ever seen a ladies' bridge club in session? One afternoon Cactus and I attended one, although it was not planned so. Deciding to feed Cactus before supper, I had taken him from his cage, and he made a dash for downstairs. I thought he was headed for the refrigerator as usual. Then came a scream from among the card tables, on one of which stood a bewildered owl. My whistle brought him to me and I put him in the next room and closed the door. In a few moments the door pushed the door open and walked into the party. Cactus followed. Before anything could be done, Cactus had landed on one woman's head and seemed to be having a wonderful time amid all the excitement. All of these

women were screaming and terrified of a harmless little owl, which I finally got into the kitchen for a meal—and a lecture.

About a week before Thanksgiving, my English instructor told me that Cactus could perform before the whole high school a few days after the Thanksgiving vacation. The "big day" never came.

Sunday morning after Thanksgiving Day a heavy snow had fallen on top of an earlier snow. The night had been bitter cold, and I went to the porch to see how Cactus had slept. His cage door was open! I whistled a number of

times, but no Cactus! Within ten minutes the four members of our family, and the dog, too, were out in the snow searching the neighborhood. We stopped for breakfast, which I could hardly eat, and then continued the thorough search.

Finally, Daddy happened to glance down into some shrubbery. There was Cactus! "I found him!" he called. "Is he alive?" "I don't think so." He wasn't. I could only ask my father to remove the bird band from Cackie's leg. That band now rests in a drawer in which I have fond reminders of other pets who have been my friends.

FAULTS

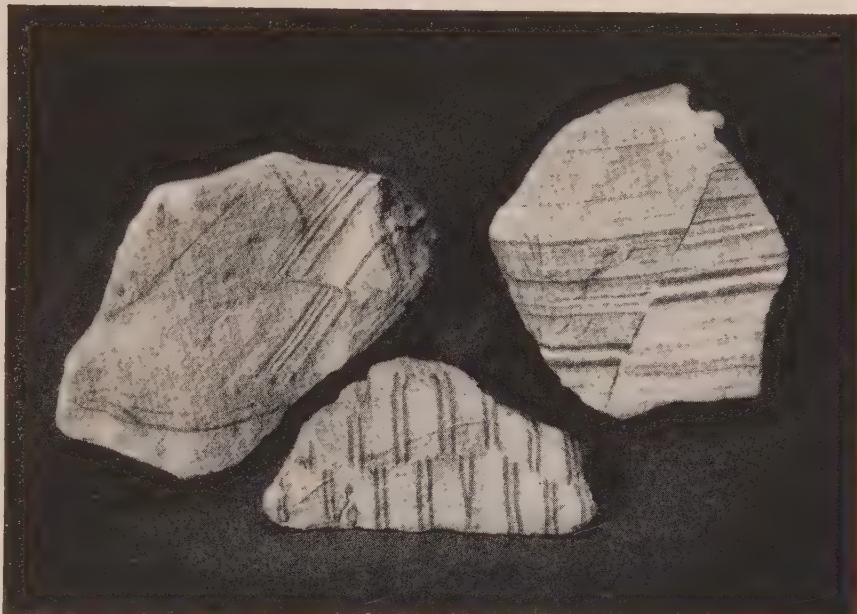
By C. S. GWYNNE

MOST of us think of the earth upon which we live as a very solid place. Perhaps it never occurs to us that the crust might break, and that along the crack thus created movement sufficiently great to shake the surrounding country might take place. Yet that such things happen has been learned from studies of earthquakes, and of the displacement in the rocks of the earth's crust.

Perhaps you have found a stone that looks as if it had been broken along a crack and later had sealed up. Or you may have seen one wherein the opposite sides look as if they had moved along the crack before it was sealed up. Cracks of this sort, where the two sides of the rock appear to have shifted, may have been related to an ancient earthquake.

It is now known that many earthquakes are caused by sudden movements of the earth's crust along a crack. Such cracks are called faults by the scientists. The fault may be vertical, or it may be at any other angle with the surface. Some of them have been traced for hundreds of miles. The movement of the opposite sides may be in any direction parallel to the plane of the fault. The two sides stay close together, but one moves up, or down, or sideways with respect to the other. The amount of movement along some faults is known to have totalled thousands of feet but it occurred a little at a time. With each movement there was an earthquake. Some of them were severe while others were only minor tremors registered only on the most delicate of instruments.

The specimens in the illustration are of pieces of band-



SANDSTONE SPECIMENS SHOWING THE RESULT OF FAULTS

PHOTOGRAPH BY MARGARET BONINE FOX

These are small and the earth tremor that caused the displacement of the bands was doubtless very slight, but they illustrate the method

ed sandstone in which a small amount of faulting has taken place. These pieces were once part of the solid rock of the earth's crust. Originally this hard matter was a bed of sand. This sand has been cemented to become solid rock by minerals deposited by water seeping down from the earth's surface. The deposition of minerals of different colors caused the banding.

After the development of the bands and the hardening of the rock, faulting took place. These faults cut the bands and displaced them. Of course these are very small faults, and the movement along them was probably so slow that the surrounding earth was not noticeably affected. If earthquakes did take place they probably did not amount to much. After the movement had ceased the fault was sealed by mineral matter.

These specimens came from a sandstone deposit in the Black Hills of South Dakota. They are small but they well illustrate the faulting in the earth's crust that is responsible for the development of large or small earthquakes.

Things to Think About

It is interesting to note that an investigation of the activities of the United States Bureau of Fisheries with respect to its administration of the Alaskan salmon resources and the harvesting of the fur seals of the Pribilof Islands is now under way. The Federal Bureau of Investigation, Acting U. S. Commissioner of Fisheries Jackson, and other officials, are in charge of the inquiry. Intimation has been given that criminal prosecutions might later result. In connection with this investigation we would refer those interested to *Nature Magazine* for November, 1936, on page 299 of which began an article entitled "Salmon, Seals and Skullduggery." In that article William L. Finley provided enough inspiration for immediate investigation, but more than three years have elapsed.

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In the twenty-eight years that have gone by since the Weeks Law was passed, creating the National Forest Reservation Commission and empowering the purchase of land for National Forests, 16,369,751 acres of land have been purchased. An additional 890,094 acres have been approved for purchase, but are not yet formally transferred to government ownership. For the land actually purchased, the government has paid \$61,260,435. Largest acquisitions have been in Arkansas, Michigan, Minnesota, Missouri, Virginia and Wisconsin.

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Perils in the woods during the hunting seasons do not seem to diminish despite constant educational efforts of Fish and Game Commissions. Pennsylvania has kept a careful record for a number of years, and its finally completed report for 1938 shows 488 hunting accidents, of which 78 were fatal. This is a new high, both for fatal and non-fatal accidents. The shotgun was the most lethal weapon, and the greatest hazards were among those shooting small game. Curiously enough, 78 per cent of the accidents occurred during clear weather, and in 53 per cent of the cases the victim wore a red cap, or red back on his hunting costume, or both. Seventy-five per cent of those responsible for the injury were more than 21 years old and in ten per cent of the cases the age was not known. Sixteen per cent of the injuries were self-inflicted, or 78 cases out of the total of 488.

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A standing committee on conservation has been established by the Minnesota Education Association. For some reason—possibly the multiplicity of demands upon the school curricula—organized educators have rather consistently ignored this fundamental question. It is one, however, that must be incorporated in school work in one way

or another, either by integration in present studies, by addition as a separate course of study, or in the currently popular social science courses. Emphasis in teacher training schools is, of course, of primary importance.

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The Massachusetts Forest and Park Association has issued an interesting bulletin telling the story of the first quarter of a century of the town forest movement in the Bay State. The records show that 107 towns have such forests; that the total acreage is 31,702; that 6,044,201 trees have been planted. And town forests pay in actual revenue, let alone their value for watershed control, recreation, and other purposes. Harris A. Reynolds, secretary of the Association, has been the inspiration of this movement, which is an example to the rest of the states.

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Located on the Redwood Highway, about five miles north of Crescent City, California, is a tract of Coast Redwoods, *Sequoia sempervirens*, known as the Mill Creek Redwoods and one of the great forests of the world. Through \$80,000 in private gifts made through the Save-the-Redwoods League, 6772 acres of this forest have been preserved and transferred to the California State Park Commission. An additional 2518 acres are subject to option agreement and will be purchased by State or private funds as they become available.

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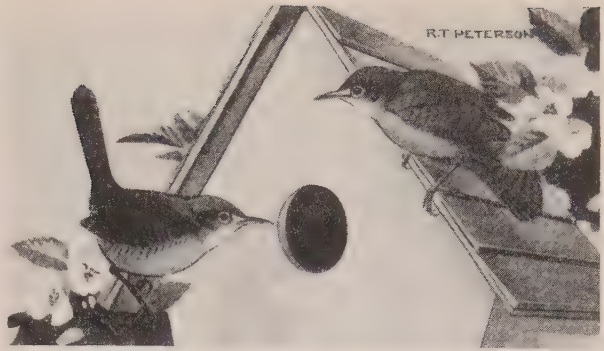
Californians with sufficient pride in their State to wish to see its rural roadsides restored to beauty and protected from ruin by billboards and other commercialism, would do well to affiliate themselves with the California Roadside Council, 3311 Pacific Avenue, San Francisco. This organization is doing a splendid work of education and action. It has available practical advice to individuals and groups as to what they can do and how to do it. State law in California permits rural zoning and control of roadside structures. The Council can show Californians how to take advantage of the opportunities to make their State more attractive to themselves and to visitors.

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Market hunters, duck bootleggers and establishments illegally selling wild ducks have been the object of a concerted drive by Federal game wardens in many parts of the country. Cooperation of Federal Court judges has resulted in stiff fines and prison terms for the offenders. In California the drive broke up a ring of wildfowl bootleggers, and 21 hotel, restaurant and poultry company proprietors and employees were tried and fined a total of \$2190.



MOUNTAIN GOAT—ONE OF THE WILDLIFE STAMPS PAINTED FOR THE 1940 SERIES BY LYNN BOGUE HUNT



ROGER TORY PETERSON, AUDUBON SOCIETY ARTIST, MADE THESE HOUSE WRENS FOR THE STAMP SHEET

Wildlife Has a Week

BY PROCLAMATION of the President of the United States the week of March 17 to 23 has been set aside as National Wildlife Restoration Week. Not that seven days—or seven years—will be enough to restore our wildlife to anything approaching its former abundance, or that one week each year is all that should be devoted to thinking and acting about this question. However, during this time every effort will be made to focus the attention of the American people upon the importance of wildlife as a national resource, esthetically and economically.

Local state and national organizations working in the conservation field will lend every effort to this public education. Under the joint auspices of the American Wildlife Institute and the National Wildlife Federation, a

wildlife conference will be held in Washington, D. C. A program of both popular and specialized interest will be presented during a three-day session.

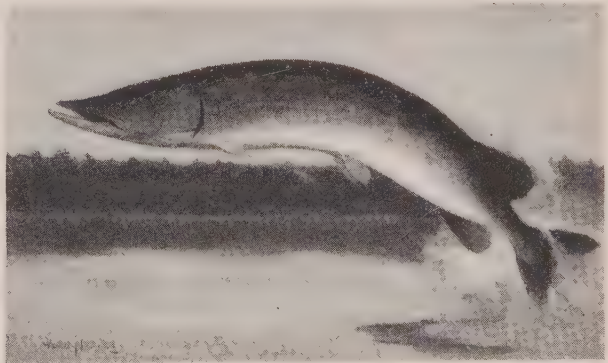
For the third successive year one of the features of wildlife week will be the distribution and sale of wildlife stamps by the National Wildlife Federation. The 1940 stamps will consist of a sheet of one hundred stamps, with twenty-four designs and four key stamps. The original pictures were painted by such noted artists as Lynn Bogue Hunt, W. Goadby Lawrence, Roger Tory Peterson, Jacob B. Abbott, George M. Sutton, Walter Alois Weber, Leslie Ragan and Francis Lee Jaques. An album with places for the 1940 stamps, and those of previous years, will be published. Funds derived from the stamp sale will be used for conservation and educational programs in this field.



JACOB BATES ABBOTT PAINTED THE TIMBER WOLF; LESLIE RAGAN DID THIS DOGWOOD STUDY



WALTER ALOIS WEBER DID THE RARE ROSEATE SPOONBILLS, AND W. GOADBY LAWRENCE THE LEAPING PIKE



GARDENIAS DO BEST
IN AN ACID SOIL—
GERANIUMS DEMAND
A SOIL THAT IS ON
THE ALKALINE SIDE
TO PROSPER



KNOW YOUR SOIL

By C. F. GREEVES-CARPENTER

TO THE average amateur gardener soil is just so much earth in which to plant seeds, bulbs, shrubs or trees. To the experienced horticulturist it is a vast chemical laboratory, abounding in all sorts of disasters if the wrong ingredients are present, or if some essential ones are lacking.

The man who makes his living from growing plants realizes the importance of knowing something about the medium in which he has to operate, and so has his soil analyzed, not only to determine its acidity or alkalinity, but to ascertain which of the minerals essential to plant growth may be deficient. In the past this has necessitated the services of a soil chemist, but now it is possible for the garden enthusiast to run an analysis himself with one of the short-cut garden soil testing outfits that have recently been packaged by several manufacturers. These contain full directions and equipment for making tests, as well as a list of the soil preferences of the more familiar garden vegetables and flowering plants.

One of the first things that every gardener should learn about his soil is its chemical reaction, its pH

value, as the soil chemists term it, or, in simpler words, whether it is "sweet" (alkaline) or "sour" (acid). Plants, as everyone knows who has made a serious attempt to grow them, seem to have minds of their own about the soil in which they are to be grown. Some plants are quite mulish if planted in a soil of the chemical reaction they dislike. They simply will not grow, or, growing, do so with such lack of enthusiasm that they are dwarfed, sickly-looking specimens of which we are ashamed.

Roughly speaking, the preferences of plants may be broken up into five classifications, ranging from highly acid to very alkaline. To test soil for its chemical reaction is really a simple matter. Let us suppose, for instance, that we want to grow rhododendrons in one section of the garden and geraniums in another. On checking with the list of soil preferences—and that is the intelligent way to grow plants—we find that rhododendrons prefer a very acid soil, while geraniums do best in one that is quite alkaline in its reaction. It would, indeed, be rare if we found that the soil in one section of our garden was acid and in another alkaline, but first let



TESTING SOIL IS SIMPLICITY ITSELF

Samples of soil taken a couple of inches under the surface are gathered with clean spoon and put in clean glass

us, in imagination, make our tests and find out for certain.

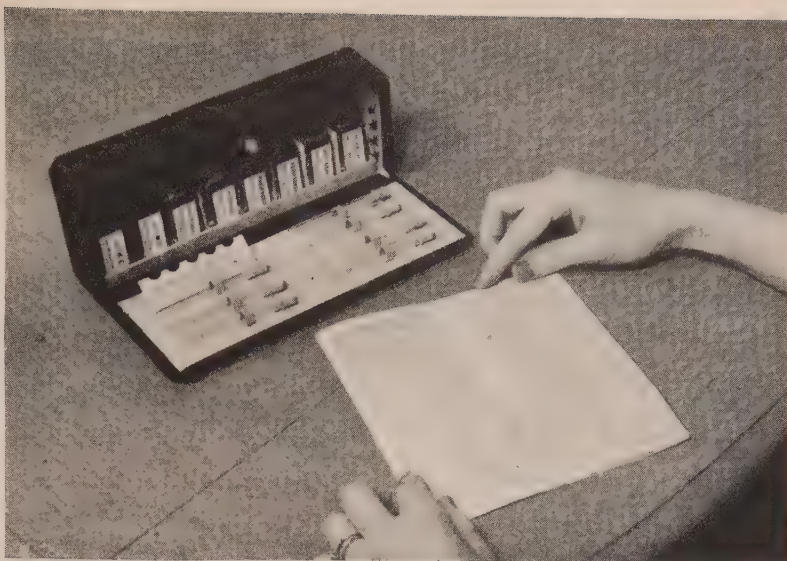
In addition to the soil testing set we will need a couple of clean glasses, and a clean spoon or trowel, and we must remember not to touch the soil sample with our hands. Sallying forth into the garden, we dig a couple of inches below the surface and remove a spoonful of the soil and place it in the glass. Let us tentatively mark that "No. 1" on a piece of adhesive tape stuck to the glass. That is from the spot where we wish to plant rhododendrons, and we mark the spot correspondingly. We repeat the process with the spot selected for the geraniums.

Taking both samples to a convenient place we can proceed to make the actual test. We put a certain quantity of sample "No. 1" in a test tube with some Lime Testing Solution, corking and shaking the tube and allowing the soil to settle. A colored liquid rises to the top and this we compare with a color chart, which has five colors, each identified with a letter so that we can readily refer to the chart of plant preferences. If the soil proves too alkaline for the rhododendrons, then we find, on consulting the booklet of directions, that this reaction may be changed by the simple process of adding ammonium sulphate to the soil at the rate of one and a half pounds per 100 square feet. This chemical, too, contains 20 per cent nitrogen, so it also has some fertilizer value.

Let us assume that our soil sample "No. 2" tests out to be quite acid, and if we are determined to grow geraniums there rather than adapt our planting program to our soil reaction, we will have to add ground limestone at the rate of five pounds per 100 square feet.

If, instead of making a number of individual tests, we wish to gain a general idea of the soil reaction of the entire garden, it is only necessary to take several samples from different sections, mix them together and then make the one test. This would guide us in selecting our plants, or in changing the chemical reaction of the soil to suit those seeds, bulbs, shrubs and trees we wish to grow.

No one ever appears to be satisfied with his lawn or grass areas. Certainly by comparison with European lawns, our own are far from perfect and always seem to be a problem. The firms selling lawn seeds are not to blame, for most of them supply good seeds. They realize, however, that the average gardener has no definite knowledge of the chemical reaction of his soil, and, therefore, in order that some grass will grow, a mixture of seeds is prepared, a percentage of which are acid-loving, with the balance definitely preferring an alkaline soil condition. The lawn seed companies are thus endeavoring to meet the need for lawns in as practical a manner as possible. The intelligent gardener, however, who knows the chemical reaction of his soil, can purchase lawn seed adapted to his particular soil, or he can change the chemical re-



SOIL TESTING KITS HAVE FULL DIRECTIONS

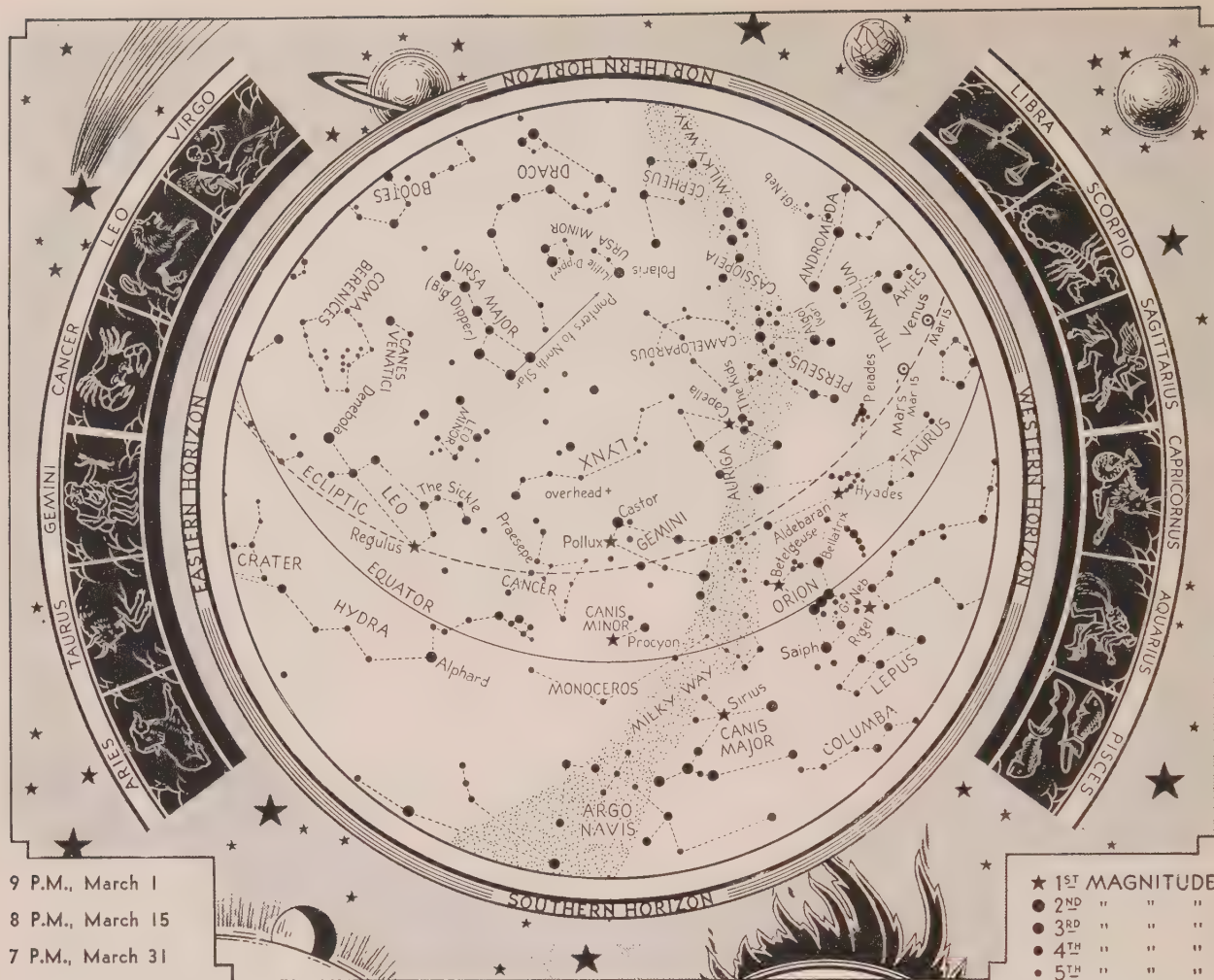
The acid or alkaline tendency of the soil is found, as well as the lack or presence of essential minerals

action to suit the seed he wishes to plant. If we would sow seed adapted to the soil in which it is planted, our lawns would be more successful.

In the past, and in perhaps the majority of cases today, plant material was placed in the ground with little thought as to the "sweetness" or "sourness" of the soil. If the plants did not do well, either the gardener became discouraged and changed the planting the following year, thinking he did not have any "luck" with that variety, or perhaps he merely limed the soil in the hope that that might remedy the condition. Liming not only has the effect of making the soil reaction alkaline, but it increases the soil bacteria. Liming alone will not, however, work miracles and some acid-loving plants just will not grow in soil that has been limed.

Those days of hit and miss gardening are about over. For years professional soil chemists have been busy making analyses. In the natural evolution of things it is only to be expected that commercial firms should benefit by the discoveries in the scientific field and should formulate approved short-cut methods for accomplishing the same end. Thus the home gardener, with no previous knowledge of soil chemistry, may now work out his own gardening salvation.

Testing for the chemical reaction, however, is only scratching the surface of intelligent gardening. There is a lot more to the chemistry of soil than that. Plants require many mineral elements in the soil if they are to give of their best for our enjoyment. Of these, three are termed essential elements—nitrogen, phosphorus and potash. Nitrogen stimulates growth of foliage; phosphorus aids the rapid development of flower and seed production; potash is definitely needed to assure good root growth. The less important, or secondary, elements are also essential, but it is fairly safe to assume they are present in sufficient quantity unless one is doing some scientific research in horticulture, when it would be advisable to have a complete and accurate analysis (Continued on page 177)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The New McDonald Observatory

By ISABEL M. LEWIS

AN amateur's love for astronomy has borne fruit in the erection in Texas of a great observatory, which, even before the date of its dedication in May, 1939, began to make valuable contributions to the advancement of the science in which its founder was so deeply interested.

William J. McDonald was a banker of Paris, Texas, who had an abiding interest in the sciences of botany, zoology, and more particularly, astronomy. Upon his death, at the age of eighty-one, it was found that he had willed the greater part of his fortune of more than a million dollars to the University of Texas, "for the purpose of aiding in erecting and equipping an astronomical observatory to be kept and used in connection with and as a part of the University for the study and promotion of astronomical science."

Mr. McDonald was a bachelor, but relatives who had received minor bequests attempted to break the will. To

avoid prolonged litigation the Regents of the University, in 1930, four years after Mr. McDonald's death, effected a compromise by which they received \$800,000, and Mr. McDonald's relatives the remainder of the estate. Although this sum was amply sufficient for the erection and equipment of a great observatory, an insufficient amount would have been left for upkeep and for the salaries of astronomers to carry on its work. While still considering the best way to carry out the terms of the will, the Regents of the University were approached by the University of Chicago, which had under consideration the construction of an observatory somewhere in Texas. It was proposed that the two universities operate the McDonald Observatory jointly, and in co-operation with the Yerkes Observatory, which is under the control of the University of Chicago. Under the terms of the agreement the University of Texas was to build and equip the observatory and the two universities would co-operate in its operation

for thirty years. The University of Texas was to bear about one-fourth, and the University of Chicago three-fourths, of the cost of its maintenance. At the end of the period the agreement may be renewed, modified, or annulled.

Next to its equipment, and possibly of equal importance with it, is the selection of a site for the observatory. Unfortunately many of our observatories are not free to choose their sites, but in this respect the McDonald Observatory is exceptionally fortunate. In the western part of Texas there is a semi-arid region of clear skies and lofty heights, one that is peculiarly adapted to the needs of an observatory. The site eventually chosen was Mt. Locke in the Davis Mountains. The elevation is 6828 feet above sea level, and the site more than 1500 feet above the sparsely settled plateau of ranch-lands at its base. An excellent road has been built to the summit by the state, and there is a clear view of the horizon in every direction. The observatory is in an isolated position and there is no interference whatever from neighboring lights. The nearest town is Fort Davis, eighteen miles away, and the nearest railway at Alpine is forty-two miles from the observatory.

The principal instrument of the McDonald Observatory is an 82-inch pyrex glass, reflecting telescope, which was constructed entirely by the Warner and Swasey Company of Cleveland. The optical work was done by or under the immediate supervision of Mr. C. A. R. Lundin. This telescope is the second largest in the world, surpassed in size only by the Mt. Wilson 100-inch reflector. The optical quality of the 82-inch mirror, which has been tested by Mr. C. A. R. Lundin and Dr. J. S. Plaskett, director emeritus of the Dominion Astrophysical Observatory, who acted as scientific adviser of the company, has been found to be practically perfect. No part of the nearly 5000 square inches of surface deviates as much as seven-tenths of one-millionth of an inch from the true theoretical form.

At the dedication exercises, which were held in the dome of the telescope on May 5, 1939, the completed observatory was formally presented to Dr. Otto Struve, Director of the Yerkes Observatory, who will also be Director of the McDonald Observatory, by Mr. C. J. Stillwell, recently appointed president of the Warner and Swasey Company. Through the generosity of Warner and Swasey Company a "McDonald Observatory Special" carried many astronomers on a 4000-mile journey from Chicago to Texas (and back) to a four-day astronomical symposium held in conjunction with the dedication exercises. More than four hundred people attended these exercises, and among the astronomers were directors of many observatories, including several from Europe, Canada and Mexico.

A unique feature of the McDonald Observatory is the utilization of the space in the cylindrical space below the

floor of the dome. This has been divided into three floors and provides space for a library with stacks, dark-rooms, offices for members of the staff, and a number of small bedrooms and, in addition, a large assembly room. Permanent observers live on the mountain in houses built just below the summit.

The work planned for the 82-inch telescope is largely spectrographic, and it will not enter into competition with the 100-inch Mt. Wilson reflector in the investigation of faint extra-galactic nebulae, which is now being done so successfully by Dr. Hubble and others at Mt. Wilson. As Dr. Henry Norris Russell has pointed out, there is a great field for work in the study of individual stars, especially among faint dwarf stars near our own solar system. Even before its dedication Dr. J. P. Kuiper, a member of the staff of the Yerkes Observatory, discovered with the new McDonald reflector two more extremely dense white dwarf stars similar to the companion of Sirius. Such stars are abnormally heavy for their size. One of those discovered by Dr. Kuiper has a weight of 9000 tons to the cubic inch. Observations with the telescope were started in March of last year. Three more white dwarfs were found by Dr. Kuiper before the year was over. This increases the number now known to twenty-five. The three more recently discovered are comparatively light for stars of that type, yet they are many thousand times heavier than any kind of matter with which we are familiar. They have densities of about three tons to the cubic inch. Some of the white dwarfs weigh as much as a million pounds to the cubic inch. Compare with such stars the red giants that have densities less than a thousandth part of that of air at sea level, or even our own sun, which has a density only 1.4 of that of water!

Among other interesting subjects of research that will receive attention at the McDonald Observatory are the interstellar nebulosities and their radiations, the nature of the luminosity of the night sky, and of the zodiacal light and the faint red dwarf double stars. The skill and enthusiasm of the staff and the near perfection of the instrument as well as the many advantages of its site promise well for the future of this newest of astronomical observatories.

Spring will begin this year in the northern hemisphere at 1:24 P.M. on March 20, Eastern Time, when the sun will cross the equator coming north.

The same remarkable distribution of the planets that was observable last month will continue for the first week in March. Mercury will be near the western horizon followed in order by Jupiter, Venus, Saturn and Mars. Mercury will rapidly disappear in the evening twilight and will be in inferior conjunction with the sun on March 15. Venus will be in conjunction with Saturn on March 8. Mars is high in the southwest at sunset and sets about five hours after the sun. By the end of the month Jupiter will be too close to the sun for observation.

Few people realize that the well-known piece, "The Flight of the Bumble Bee", is from the children's opera called "The Bumble Bee Prince" composed by Rimsky-Korsakow. The opera (of course in condensed form) is recorded by Victor on both sides of four consecutive records. The words and narration are in English. Accompanying the records is a folder giving the words of the songs, although they are sung with commendable clarity. The story is presented by the Junior Programs Opera Company, with accompaniment by the piano and the Hammond organ.

The whole story and the recordings are so well done that this group should be extremely popular. The records might be especially helpful to teachers and schools to aid the children in getting acquainted with an enjoyable story and some fine music. And they will also help them to enjoy and understand the longer adult operas. (Bluebird Records, Set BC-14)

Nature subjects play an important part in many of the Victor recordings listed under the general subject heading of "Songs for Children". A collection of the records in this group make a fine musical library for the younger members of the family. And many adults will get much pleasure from listening to the lilt and rhythm of some of these simple little melodies so beautifully sung. Most of these records have from two to five individual little song-rhymes on each side, bits of poetry put to attractive music. Valuable in the school for song work in the lower grades, they are equally charming for the hour just before bedtime, and are a fine antidote for much that the radio offers at that time of day.

Edna Brown, a contralto, sings two lovely and longer-than-ordinary child songs on record #20623-A, these being "The Leaves' Party" and "Thanksgiving Song". On the reverse of the same disc soprano Alice Green sings "Land of Nod", "Tracks in the Snow" and "Jack O'Lantern". Edna Brown has record #20441-A all to herself, the songs including two with a Nature theme—"Granddaddy Long Legs" and "Katy Did". We confess to a certain prejudice for the lovely soprano of Anna Howard, who, on #22621-B, sings twelve charming little songs all drawn from *The Music Hour* published by Silver, Burdett. We've played this one several times just to get the little bit about the morning glory that must have been pretty tired if it couldn't keep awake until noon. It's apparent that we haven't grown up much after all.

Other excellent records in this group are #20347-B, with songs by Erva Giles; #20624-A, with nine songs by Anna Howard; #20617-A, with eight Nature songs of particular charm, sung half by Edna Brown and half by Alice Green. If you have small fry in the family any or all of these recordings will be welcomed by them.

Some years ago George Jean Nathan waxed highly critical of bird songs, asserting that there was no music in them. His criticism was brief but pointed. At that time NATURE

MAGAZINE offered a prize for the best answer to Mr. Nathan in approximately the same number of words. He was, we think, effectively answered, and there would be no point in referring to this friendly controversy had we not just gotten through reviewing several lovely bird songs recorded on Victor records.

To the bird student probably the most interesting of these is the record (#25765-A) of native bird songs made in the wild by A. R. Brand of Cornell University. Captured with a specially-designed parabolic microphone and a field recording outfit, the songs of the hermit thrush, wood thrush, brown thrasher, whippoorwill, field sparrow, phoebe, black-capped chickadee and the loon are all preserved. Mr. Brand had, of course, to wait for his wild opera to be performed at the will of the singer, with the result that there are lapses between songs through which we wait expectantly. The results, considering the difficulties involved, are remarkable.

In contrast, in uniformity in strength of reproduction and in continuity, are of course, the recordings of the human imitations of bird calls by Charles Gorst (#17735-B) and Charles Kellogg (#35785-A). For Nature study work with youngsters, and for the average home record library, these discs will probably prove the more popular. An ear so acutely attuned to the avian concert as that of John Kieran of "Information Please" found Mr. Brand's recording elusive, although he would probably have less difficulty with those of either Mr. Gorst or Mr. Kellogg. The former gives us the cardinal, oven-bird, red-eyed vireo, Baltimore oriole, mourning dove, western meadow lark, robin, killdeer, blue-jay, blue-bird, wood thrush, yellow-billed cuckoo and the mockingbird. Mr. Kellogg imitates catbird, stormy petrel, cardinal, house wren, loon, red-winged blackbird, bobolink, California mountain quail, ring dove, goldfinch, wood pewee, blue-jay, whippoorwill, mourning dove, meadow lark, white-throated sparrow, catbird, barn owl, hoot owl and a general melange of marsh bird songs.

May we recommend the following recordings of little songs of charm, interesting particularly to the youngsters but so well chosen as to attract, also, the adults of the family? There is #25393-A, which presents ten chording songs sung by Olive Kline, Elsie Baker and Elliott Shaw; #24540-B, with eleven little songs of Nature and geographical interest; #19891-A, with eleven delightful little songs from *New Song Book and Music Reader*; #24536-A, with seven songs for the youngsters drawn from *Elementary Music*. All of these are beautifully sung and with such clarity that the youngsters—and maybe you, too—will be singing them after three or four playings.

A handy record rack made of ply cardboard that folds up when not in use and holds 24 records when in use is now available from your dealer. . . . A new needle good for 1000 playings by laboratory tests has been developed by Victor and is now on sale. . . . The new Victor catalog listing and cross-indexing some 7500 records is now available. Six carloads of paper, a ton of ink, a couple of barrels of glue and a lot of labor went into the edition, the statisticians say.

HIALEAH'S FLAMINGOS ESTABLISH A BRANCH OF THE FAMILY

(Continued from page 146)

Many thousands of dollars are spent each year for cracked rice, dried shrimp, soft wheat and cod liver oil on which to feed the Hialeah flamingos. The rice is ordered in eight-ton lots and shipped to Miami from Louisiana. The daily ration provides 150 pounds of rice cooked with forty pounds of shredded shrimp, salt, wheat, and one quart of oil. The feeding troughs are set in a trench, so that the birds can fill their maws with water as they swallow.

Flamingos are habitually disagreeable to each other, adult birds quarreling off and on all the time. They even take their bad temper out on young ones by nipping them as they skip past, but the pinch does not hurt much. The little birds start fighting when they are two days old and pick the feathers out of each other. Sometimes they get so tangled up that it takes a major operation to undo them. One day at the Park, three half-grown tomboys got their necks so snarled that the man on watch had difficulty uncoiling them. The neck of one was wound about a playfellow's spindling leg, and another one that was mixed up in the jamboree had wrapped its neck in a tight spiral about the neck of a third.

While on his renowned tour of exploration a century ago, the great Audubon came upon a group of flamingos that had alighted on one of the Florida Keys. He remarked on the resplendent color of *Phoenicopterus ruber*. In truth, the coat of the flamingo of the Western Hemisphere—of Haiti, Brazil, Chile, the Galapagos Islands, the Bahamas, and Cuba excels that of all other lands in depth of tone.

An entirely new word needs coining correctly to describe true flamingo pink. Travelers who have seen flamingo flocks staining a tropical sky in flight, or twisting, turning, preening their coats, or fluffing out their feathers of fiery rose on their native shores assure us that the birds that so contentedly carry on under the palms at Hialeah are fully as remarkable for the depth and range of their color as those discovered long ago by Mediterranean adventurers in the Caribbean, and named by them "a splendid thing"—Flamingo.

South America

Alexander von Humboldt, Charles Darwin, Alfred Russel Wallace and W. H. Hudson head the list of scientists and naturalists who have explored South America, bringing back records of its exotic flora and fauna. Both the explorers and the results of their explorations form an interesting and important record of value to the lay reader. Recognizing this, Paul Russell Cutright has written a book entitled *The Great Naturalists Explore South America*. The first part of the book deals with the explorers and their travels; the rest with the fauna they found and described. As such it is an historical record and a condensation of the zoological information gathered. A zoologist by profession, the author is also an entertaining writer and has produced a valuable and intensely interesting book. Published by Macmillan, it sells for \$3.50.

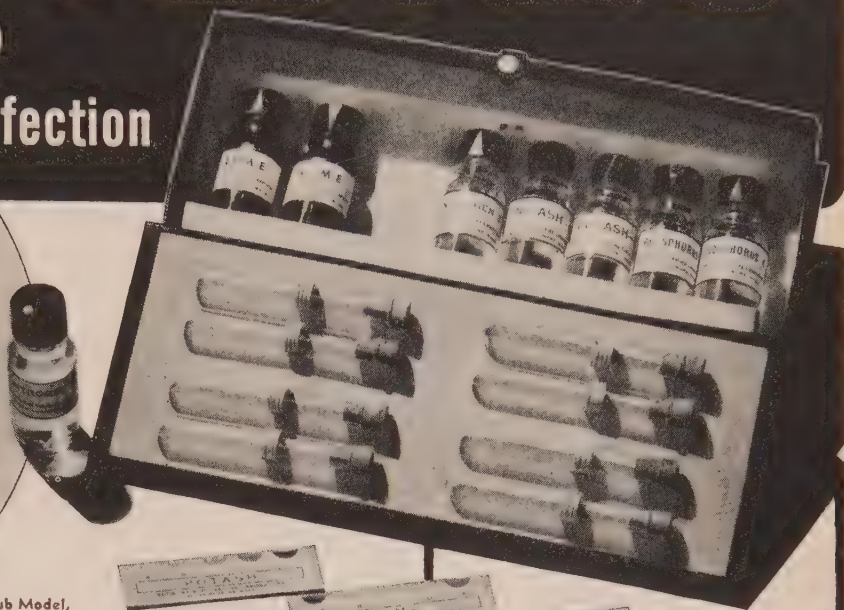
SOIL TESTING

shows you how to
Grow Plants to Perfection

SUDBURY SOIL TEST KIT

Easy to Use

**No knowledge of
chemistry required**



New Club Model,
size 9 3/4" x 3 1/2" x
2". Makes 50 individual tests for
nitrogen, phosphorus, potash and acidity.

*Wouldn't you like to enjoy—this year—the rich, velvety lawn, the abundance of flowers, and the strong, healthy plants which are the *proof* of your skill as a gardener.*

Such results are far easier to obtain than you might think. Experts say that four out of five lawn and garden failures are due to soil deficiencies that could easily be corrected by soil testing.

Have you Met with any of these Failures?



Lack of Blooms

May be caused by insufficient phosphorus, or by too much nitrogen. Soil testing will tell you which.

Weak, Sickly Growth

Often caused by lack of phosphorus or potash, or incorrect acidity. Excess nitrogen causes soft, weak growth, and reduces disease resistance.



Retarded Development

Lack of nitrogen retards leaf growth. Insufficient phosphorus or potash means slow establishment of seedlings and poor root growth. Excess potassium delays maturity.



A "Spotty" Lawn

Improper acidity and lack of nitrogen are common causes of lawn failure. For good results, both conditions must be corrected.



CHAPERONE FREE
to pre-season buyers

Order your Sudbury Soil Test Kit early, and we'll send you FREE a full 4-ounce bottle of Liquid Chaperone—the wonderful new dog repellent that rain does not wash away. This special offer must be withdrawn after the start of the active gardening season.



What Your Plants Need—To possess the lovely lawn and garden of your dreams, you should simply *make sure* that your plants have:

1. The acid, neutral or alkaline soil conditions that they require, and
2. A *correctly rationed* diet of the three important plant food (fertilizer) elements—nitrogen, phosphorus and potash—balanced in accordance with your soil conditions and individual plant needs.

No More Guesswork—When you test your soil, you end the guesswork that so often results in failure. You *know* whether your soil is too acid or too alkaline—and *how much* lime or other material you should add to make it right. You apply the *kind* and *amount* of fertilizers which are essential to healthy plant growth.

Danger of Over-Fertilizing—As most gardeners know, a soil that is too acid or too alkaline acts as a poison to many plants. But did you realize that excess fertilizer can be almost as harmful? Too much nitrogen leads to general weakness and hinders flower formation. Excess potash slows up growth. You can prevent these disappointments—and save fertilizer, too—by testing your soil before you plant.

WHAT USERS SAY



Amazing Results—We have in our files dozens of letters from users who tell us of the amazing results they have obtained with Sudbury Soil Test Kits. Here is an unsolicited letter from Mr. George Thurkauf of Englewood, N. J.:

"I grow exhibition dahlias. This year I cleaned up with them, and my success was due to your product. It was not a case of hit and miss when I applied my fertilizer. I know what my soil needed and my results have proven that."

Saved His Lawn—Another user says: *"My lawn was in bad shape for three years, and I thought I'd have to dig it up. I decided to test my soil first and got one of your kits. I followed the instructions, and my lawn is perfect now. This kit certainly saved me a lot of trouble and expense."*

It's Fun—It's Easy—There's nothing difficult about soil testing with a Sudbury Kit. All you need is the ability to read, and to compare colors on a chart. No knowledge of chemistry is required.

The Club Model Kit

The Sudbury Soil Test Kit, new club model, is a beautiful piece of equipment—used by thousands of enthusiastic gardeners from coast to coast. Cased in handsome sturdy imitation leather. Makes 50 individual tests for nitrogen, phosphorus, potash and acidity. Complete instructions. Helpful chart shows need of lawn grasses, 74 flowers, 50 vegetables.

A Permanent Investment—Best of all, your Sudbury Kit is a permanent investment. With the inexpensive refills now available, you can use it year after year.

SEND NO MONEY

We want to help you make your first soil test. Take a Sudbury Kit out into the garden, and judge for yourself whether it is going to be every bit as useful as we say. If you think not—if for any reason you are not delighted with your kit—you can return it to us and we will gladly refund the full purchase price. It isn't even necessary to send any money now. You can pay the postman when the kit arrives. Only \$4.75 plus few cents postage. Enjoy your garden as you never have before. Use this handy coupon now.

MAIL THIS COUPON NOW

Sudbury Soil Testing Laboratory
P. O. Box 720, South Sudbury, Mass.

Please send me one Sudbury Soil Test Kit, New Club Model. I will pay the postman \$4.75 plus few cents postage. I understand that you will refund the full purchase price, if I am not delighted with the kit.

Check here if you buy early ☐ Please send me free 4-ounce bottle of Liquid Chaperone as offered.

Name

Address

City

Want us to pay postage? ☐ Check here, enclose \$4.75 and we will ship prepaid. Same money back guarantee.

THE SCHOOL PAGE

★ ★ ★

EDITED BY DR. E. LAURENCE PALMER

*Professor of Rural Education, Cornell University, and Director of
Nature Education, The American Nature Association*

Summer and Biological Field Stations by Homer Jack

Soon comes April, the time of year when, in some parts of the country, fuzzy buds shed their winter coats and burst forth on a foggy, spring morn. April, too, is the time when certain birds, in other sections of the continent, prepare for migration to better-suited climes. To many Nature-study and

biology teachers in all parts of the land, April is the joyful period when they shed their winter worries and burst forth with ideas on where to migrate during the fast-approaching summer vacation. Many a weary science teacher plans to descend upon the summer session of a university turned country club, and, with six weeks of perspiration in lecture courses, acquire dubious educational credit-hours. Fortunate and wise is the elemen-

tary or secondary school science teacher who resolves to avoid hot cities and crowded campuses and study Nature near cool forests and lone beaches at a biological field station.

Biological field stations are sponsored by institutions of higher learning with the hope of bringing *living* biology within the reach of school teachers, camp councilors and scientific investigators. In the United States today there are more than seventy of these

THE BIOLOGICAL FIELD STATIONS OF THE UNITED STATES

HABITATS	WESTERN	CENTRAL	EASTERN
Marine	Laguna Beach Marine Laboratory, Laguna Beach, Cal. Scripps Institution of Oceanography, La Jolla, Cal. Hopkins Marine Station, Pacific Grove, Cal. Santa Barbara School of Natural Science, Santa Barbara, Cal. Oregon Institute of Marine Biology, Coos Head, Ore. U. of Wash. Oceanographic Laboratories, Friday Harbor, Wash.	Louisiana State University Field Laboratory, Grand Isle, La. Mississippi Delta Teachers College Field Trip, Biloxi, Miss.	Audubon Nature Camp, Damariscotta, Me. U. of Maine Marine Laboratory, Lamoine, Me. Mount Desert Island Biological Laboratory, Salsbury Cove, Me. Chesapeake Biological Laboratory, Solomon's Island, Md. Marine Biological Laboratory, Woods Hole, Mass. Isles of Shoals Marine Zoological Laboratory, Isles of Shoals, N. H. Long Island Biological Laboratory, Cold Spring Harbor, N. Y. Duke University Marine Station, Beaufort, N. C.
Fresh Water & Woodland	Pacific Union College Field Nature School, Angwin, Cal. West Coast School of Nature Study, San Jose, Cal.	American Institute of Nature Study, McGregor, Iowa. Iowa Lakeside Laboratory, W. Okoboji Lake, Iowa. Michigan State College School of Field Biology, Augusta, Mich. U. of Michigan Biological Station, Cheboygan, Mich. Lake Itasca Forestry and Biological Station, Itasca Park, Minn. Franz Theodore Stone Laboratory, Put-in-Bay, Ohio. South Dakota State College Botany Summer Camp, Nemo, S. D. Lake Enemy Swim Biological Station, Waubay, S. D. Geneva Lake Summer School of Natural Sciences, Williams Bay, Wis.	Science of the Out-of-Doors, Lakeville, Conn. Nature Guide School, Plymouth, Mass. Pennsylvania State College Nature Camp, Huntingdon Co., Pa. U. of Pittsburgh Lake Laboratory, Presque Isle, Maine.
Mountain	Yosemite School of Field Natural History, Yosemite Park, Cal. Science Lodge, Boulder, Colo. Rocky Mountain Biological Laboratory, Crested Butte, Colo. Biological Field Course of Texas Technological College, Las Vegas, N. M. U. of Wyoming Science Summer Camp, Centennial, Wyo. Walla Walla College Field Nature School, College Place, Wash.		Merricomm Biological Laboratory, Chesham, N. H. New Hampshire Nature Camp, Lost River, N. H. Allegany School of Natural History, Quaker Bridge, N. Y. Mountain Lake Biological Station, Mountain Lake, Va. West Virginia University Biological Expedition, Morgantown, W. Va. Oglebay Park Nature Leaders Training School, Wheeling, W. Va.

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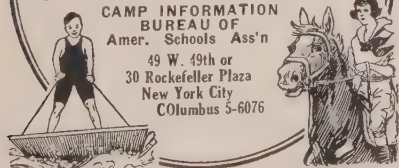
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institutions, geographically distributed be-
tween eastern Maine and southwestern Cali-
fornia and environmentally distributed be-
tween sea level and the upper reaches of the
Rocky Mountains. A chart giving the name
and post-office address of those biological
field stations of the United States that offer
formal instruction in one or more of the
biological sciences is opposite, and is arrang-
ed to give the approximate locations.

Instruction offered at these field stations
falls into two categories. The so-called Nature
camps tend to offer courses both in general
natural history and in methods of using the en-
vironment for teaching the various elementary
biological sciences. The majority of field
stations, however, adhere to "subject matter"
courses, offering both elementary and ad-
vanced field courses in one or more of the
biological sciences. Formal classes are rare
at these institutions, and there are seldom
texts—except the melodious thicket in early
morn, the pine forest at mid-day, and the
swift brook at eventide. Students visit marsh
and moraine, field and forest with competent,
experienced instructors—experienced not in
pedantry or the ability to recite long, scien-
tific names (although they can do this, too),
but trained by persistent field work to inter-
pret the out-of-doors. The better instructors
create, in the willing student and erstwhile
teacher, an understanding and appreciation
of the environment by giving him the op-
portunity to reach with his senses all those
things that heretofore he found only in books:
the poignant grace of the yellow lady-slipper,
the cadence of the peeper's shrill note, the
pneumatic uncertainty of the peat bog, the
rich anisine fragrance of the wild azalea,
and the walnut flavor of touch-me-not seed.

The mechanics of attending one of these
field stations are simple, as there are usually
no requirements for taking the less advanced
courses except a normal school or college
education and an interest in the biological
sciences—even if that interest were badly
shattered by long hours of teaching or study-
ing with well-pickled specimens and equally-
preserved textbooks. During the summer
months the stations are in full operation.
The sessions vary from two weeks to nine,
some beginning in early June and others in
late August. Living at these stations is close
to Nature, yet not uncomfortably so, for
there are usually modern cabins in which
the students reside, when not straying by
day or night to study Nature in all its infinite
forms. The cost, including board, lodging,
tuition, and excursions, averages about seven-
teen dollars a week—a moderate sum, con-
sidering one is combining education with
recreation, vocation with vacation.

After a period at one of these stations,
the teacher returns to his or her classroom
rich not in credit hours (although most sta-
tions offer these, too), but rich in knowledge
of the outdoors and replete with techniques
for making it more attractive and vital to
the elementary or secondary school pupil.
Attendance at a field station will not only
reinvigorate the teacher for subsequent school
years, but will put enthusiasm and knowledge
into his instruction—whether it be in the
second grade or the twelfth, in elementary
science or advanced biology, in a one-room
school or an urban, educational factory.

(Information on the 1940 session of any
station may be obtained either directly from
the station director at the post-office address
given on the accompanying chart, or from
the Nature Study Department of Cornell.)

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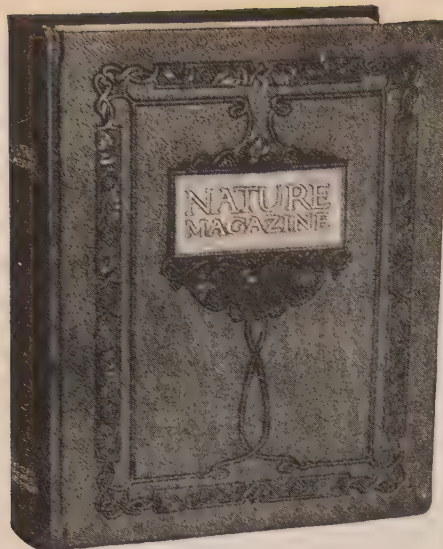
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CAMERA TRAILS

(Continued from page 131)

most interesting developments is the fluorescent light. While, of course, lights of this type have been used for some time in special enlargers for which units have been available for the past year or two, the further development of this type of lighting unit is going to revolutionize home lighting and add materially to the equipment of the photographer. They are entirely cold, and give an astounding amount of light for the quantity of electricity that they use. General Electric Company, Nela Park, Cleveland, Ohio, has a booklet describing this new lighting system, and will be very glad to send it to readers of Camera Trails.

The Bardwell & McAlister Company of 7636 Santa Monica Blvd., Hollywood, California, have announced a rather elaborate large lighting unit utilizing these lamps. Information may be obtained from them at the above address. Please don't fail to mention this department in writing to them.

For the photographer who is making enlargements, it is absolutely imperative that the camera be completely motionless at the moment of making the exposure. A contact print, or a small enlargement, may not show any actual motion but yet lack the brilliance and definition that would be given by a perfectly still camera.

For this reason, we would all undoubtedly make better pictures if we used a tripod for every shot, but most of us are too lazy to carry one. A compromise between our need and our lack of energy is furnished by the Unipod, a new one-legged support for small cameras. When collapsed the Unipod looks like a cane, but the top unscrews and is replaced by the camera which may be locked at any height from 33" to 59". Bracing the camera with our hands we can then make better pictures at our usual shutter speeds and in many cases make pictures at speeds that are much too slow for a hand-held camera. Information on the Unipod may be obtained from the Albert Specialty Company of 231 South Green Street, Chicago, Illinois. Please mention this department.

A simple gadget that will be of great help to us in arranging the composition for our pictures is a medium-weight cardboard some 4" bigger each way than our negative with a hole in its center the same size and shape as the negative. Held 18" or so from our eyes, it will help us to see just what part of the scene will appear on our negative and let us see our picture without being influenced by other objects near the picture area.

We can, of course, obtain the same results by studying the scene through the viewfinder of our camera, but the use of this card is quicker and, because we see everything in its actual size, we are better able to discover unwanted objects. Very often in selecting a composition we are unconsciously influenced by the surroundings that will not appear or suggest themselves in our final picture, and the elimination of these objects as we select our

composition will be of very real assistance. I believe that if you once try this gadget you will never start on a picture expedition without it.

Movie makers realize the value given their films by proper titles but often fail to add them to their shots because of the fancied difficulty of making them effectively. The Besbee Products Corporation of Trenton, New Jersey, manufactures a number of items to help in making really professional titles for our movies, and have recently added to their line the Titlescope, which is a pocket-sized gadget that gives full information as to distances, lights, exposure and all other factors which must be considered in making our titles fit exactly the frame of our picture. A note to the above company, mentioning Camera Trails, will bring you this complete information.

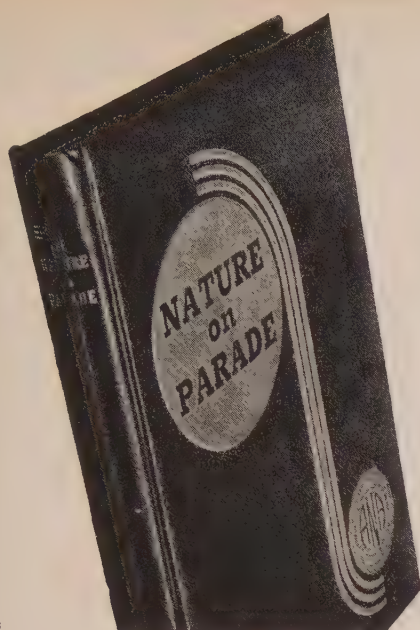
Another item that will interest the movie maker is the Bool Cine-Fader, for the making of fades, lap-dissolves and so forth. A twelve-page folder illustrating some 64 uses for the device on either the movie camera or the projector may be obtained from the American Bolex Company, Inc., at 155 W. 44th Street, by readers of Camera Trails who write to them for it.

The portrait maker who uses photoflood bulbs will be interested in the Kodak Photoflood Control, which can accommodate up to six #1 flood bulbs or their equivalent and allow the operator to control the brightness of the bulbs, thus prolonging their life and making things a great deal more comfortable for his models. It may be obtained from your dealer at \$4.50, or, if he does not carry it, write directly to Eastman Kodak Company, Rochester, N. Y.

A book that should be in the library of every Nature photographer is the newly-announced *Eyes in the Night* by Tappan Gregory, published by Thomas Y. Crowell Company of New York at \$3.50. It is a mine of information on unusual animals and their photography as well as those ordinarily found nearer home, and contains a fascinating chapter on equipment for trap shots, together with well-told stories of hunting with the camera. This book is being added to the Camera Trails Contest Prize List, and will make participation in the contest just that much more worth while. Incidentally, have you sent your prints in yet?

Camera Trails is granted space in NATURE MAGAZINE for the benefit of its readers. It can only be of greatest value with your co-operation and you are earnestly urged to suggest the topics that you would like to see treated in these columns and to criticize what has already appeared. Your suggestions are the only thing that can make this department as valuable as we wish it to be. Remember, too, that Camera Trails maintains a service to assist you in the solving of your photographic problems. Please take advantage of it.

Send your communications to Norris W. Harkness, Camera Trails, NATURE MAGAZINE, 1214 Sixteenth Street, N. W. Washington, D. C.



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KNOW YOUR SOIL

(Continued from page 169)

made. For all ordinary purposes it is sufficient to know about the three major elements so that we can intelligently determine the fertilizer program necessary to be sure of having a satisfactory, pleasing garden.

The tests for each of these elements are much the same as that for the pH value. The directions for remedying deficiencies in any one, or all three, are given in the booklet of instructions that accompanies each of the commercially-packaged soil testing outfits.

Year after year growing plants deplete the supply of available food, or chemical elements, in the soil. These must be replaced if the plants are to thrive and produce healthy foliage and the best bloom. Standard brands of fertilizers are excellent, but care should be made in selecting a particular formula for your garden so that you may be sure it meets your particular needs. Analyze your soil; know which of the major elements are deficient; choose a fertilizer having a formula that supplies these deficiencies. Or add the chemicals yourself in accordance with the suggestions included in the booklet of directions in every set.

Many disappointments will be avoided once we know our soil and the preference of our plants. We can garden to our heart's content, knowing we are working intelligently with the medium and the plant materials at our command.

A Fuchsia Surprise

Last spring D. B. Cole, nurseryman of Painesville, Ohio, sent us four plants of a new hardy fuchsia that had been christened "Scarlet Beauty". Mr. Cole wrote that he wanted to learn how they prospered in the climate of Washington, D. C., and how the field-grown plants survived transplanting. The four plants were put immediately into the ground in locations that provided full sun and partial shade. We did not know much about fuchsias and were surprised when these plants went right to work growing and, by June, had produced a display of the lovely little flowers. All four carried on with their blooming until frost. They proved tolerant of sun and shade, even though the direct sun gets good and hot in the Nation's Capital, and we are looking forward to bigger plants and more flowers in 1940. Although we did not quite realize it at the time, we were being treated to a pre-view of "Scarlet Beauty" for it was not then on the market. This fuchsia has now proved itself entitled to the adjective "hardy", and now is, we are advised, available from certain nurseries.

Humane Photo Contest

Prizes totalling \$110 are offered in the annual photographic contest held by the American Humane Association, 135 Washington Ave., Albany, New York. The contest will close June 15, 1940. Space does not permit the publication of the details but these may be obtained by writing to the Association at the above address.

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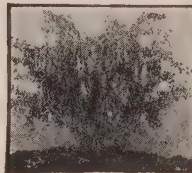
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I have found the sincere garden lover creates a garden that is as expressive of personality as the finished canvas of the artist. Given a seed catalog and a pencil, a garden will be planned in the creative spirit of an artist.

Every experienced garden owner will readily confess that when the first garden plan was made the great wealth of material was bewildering. When, however, material was carefully classified according to its possible uses in the garden, the question of selection was not so difficult as it first appeared. Let us, then, consider some flowers according to their uses in the garden.

First, there are annuals for borders and backgrounds.

AMARANTHUS—Free-growing, vari-colored annuals, such as *Love-lies-bleeding* and *Joseph's Coat*, attaining heights of 1½ to 6 feet according to variety.

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CLEOME—Tall and free-flowering, the flowers having feathery petals and long stamens. The new golden variety grows 7 feet high; spectacular in full bloom.

COSMOS—Ideal for massing, the early-flowering varieties growing about 4 feet high; the later sorts 5 to 6 feet high.

LARKSPUR—Flower spikes are attractive in the garden, and useful for cutting. The new "spire" strain will give a bright display through the season.

MARIGOLD—The tall African varieties are magnificent for the back of the border, and for the cut flower garden. Grow 2 to 4 feet high, according to the variety.

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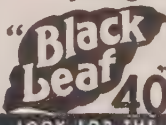
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Nature Pictures in Color

Announcement of eleven sets of colored pictures of birds, mammals and insects was made in our January issue. The response exceeded all expectations, and, due to the inclusion of some subjects in more than one set in the interests of logical arrangement, the supply of some subjects was exhausted. It was also discovered that the cost of hand collating and otherwise handling the sets was much higher than anticipated. It was necessary, therefore, before all the orders could be filled, to revise the sets and to increase the price per set to cover actual costs. These revisions have been made and this announcement supplants that made in the January magazine.

Six sets of pictures ($3\frac{1}{4}$ by $2\frac{1}{2}$ inches) are now available in a *definitely limited quantity*. Each set contains 24 subjects, assembled according to a systematic arrangement, and accompanied by brief descriptions and suggestions for use in educational and conservation work.

It has been necessary to increase the price of the sets to 15 cents; all six sets for 75 cents. Please use the coupon below to order by letter.

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B—TWENTY-FOUR MAMMALS OF SEVERAL FAMILIES

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Green-winged Teal	Avocet	Semipalmated Plover
Blue-winged Teal	Black-necked Stilt	Ruddy Turnstone
Cinnamon Teal	Wilson Snipe	Duck Hawk
Shoveller	Yellow-legs	Cooper Hawk

D—12 HAWKS; 12 BIRDS OF SIX FAMILIES

Marsh Hawk	Rough-legged Hawk	Western Meadowlark
Sharp-shinned Hawk	Duck Hawk	European Starling
Cooper Hawk	Sparrow Hawk	Bullock Oriole
Goshawk	Fish Hawk	Orchard Oriole
Red-tailed Hawk	Roadrunner	Brown Thrasher
Red-shouldered Hawk	Yellow-billed Cuckoo	California Thrasher
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E—NORTH AMERICAN BIRDS OF SEVERAL FAMILIES

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Whippoorwill	California Towhee	Warbling Vireo
Scissor-tailed Flycatcher	Rosy Finch	Cedar Waxwing
Kingbird	Oregon Junco	Seattle Wren
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F—11 INSECTS; BIRDS OF SIX FAMILIES; FOUR LARGE MAMMALS

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Cricket	Blue-winged Teal	Jaguar
Locust (Cicada)	Cinnamon Teal	Alaska Brown Bear
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This is the title that Hugh Hammond Bennett gives to one of the most important books of the day. It is important not as literature, for its philosophy or elusive charm, but because it deals with perhaps the most fundamental question confronting the American people today. As Chief of the Soil Conservation Service of the United States Department of Agriculture, Mr. Bennett is the commanding general in the battle to conserve and to restore our country's soil resources. Thirty-seven years of service in studying soil erosion problems, and in organizing the campaign for correction of the situation, provide the background for this book. Here is factual material presented in a volume of 993 pages.

Mr. Bennett has divided his book into two parts. The first deals with what has happened, why it happened, the waste of our soil resources and the significance of this waste. The second part of the book deals with the defenses we are building and must build to conserve still good soil and restore that which has suffered from the abuses of the past. This significant book should be in every public library, in the hands of every agricultural agent, in the library of every farmer who can afford it, and anywhere else that soil conservation is the concern of the individual or the community.

Published by the McGraw-Hill Book Company, *Soil Conservation* is listed at six dollars.

Physical Science

Of particular interest to the student and professional scientist and to the philosophically-minded, *The Philosophy of Physical Science* by Sir Arthur Eddington is a stimulating volume. It is a collection of lectures delivered by this distinguished astronomer-philosopher. Originally published in Great Britain, this book is brought out in this country by Macmillan at \$2.50.

Appalachian Trail

A new and revised edition of that little volume so indispensable to hikers—*Guide to the Appalachian Trail in New England*—has been brought out by the Appalachian Trail Conference, Union Trust Building, Washington, D. C. Maps and detailed trail data are such that it belongs in every hiker's pocket or knapsack. The price is \$1.25.

House for Bluebirds

Annually the Burroughs Nature Club of 14 East 55th Street, Kansas City, Missouri, offers to send to anyone sending a stamped and self-addressed return envelope plans for the construction of a bluebird house. This offer has no strings tied to it and no ulterior motive. It is merely a reflection of the enthusiasm of W. H. Hoffstot, secretary of the club, and his desire to foster love for birds, particularly among boys and girls.

Nature Camp

Sessions of the Pennsylvania State College Nature Camp will be held this year from June 27 to July 18, and from July 17 to August 7. Strategically located in a region rich in natural advantages, the camp has a resident staff of experienced field naturalists and lecturers. Professor George R. Green is the director of the camp, and full details may be obtained by addressing him at Pennsylvania State College, State College, Pa.

Mount Rainier

Owing to lack of time and funds *Mount Rainier National Park Nature Notes* is being discontinued, but in bowing out it leaves a valuable last issue. This is Volume XVII, Numbers 3 and 4, and is devoted to a descriptive listing of the birds of the Park by E. A. Kitchin. It is hoped that through the Mount Rainier National Park Natural History Association it will be possible to issue illustrated booklets on the natural history of the Park.

New Science Books

Science in terms of its meaning to the individual and to society provides the theme of three new science textbooks by Ralph H. Watkins and Winifred Perry. These books are entitled *Understanding Science*; *Science for Daily Use*, and *Science for Human Control*. The first volume lays the foundation of elementary scientific knowledge, introducing it to the student in such a way that he cannot fail to understand the reason for studying it, and whetting his appetite for more. This he will find in the two succeeding volumes that bring to dynamic life the application of scientific principles, research and the contribution of science to the lives of all of us. The three books are splendidly illustrated with carefully-chosen pictures. They are published by Macmillan.

Want to Correspond?

Two more amateur herpetologists are to be added to the growing list of those interested in exchanging letters and specimens with others similarly interested. They are Thomas Monahan, 212 Washington St., Newburgh, N. Y., and George Fichter, Reily, Ohio.

While we are on the subject of correspondence, may we add that the members of the Nature Club of the Hebrew Orphan Asylum of the City of New York, 1560 Amsterdam Avenue, New York City, would like to correspond with other similar groups throughout the country. Norman Selinger is president.

Cleveland Museum

Two publications of scientific interest have been brought out in the series of scientific publications of the Cleveland Museum of Natural History. These are *Birds of Eastern Newfoundland*, a 42-page report of field observations by John W. Aldrich and David C. Nutt; and *The Quadrat Method of Studying Small Mammal Populations*, a 78-page discussion of a method of field study, by B. P. Bole, Jr.

Dr. Lynds Jones, 75

Hundreds of bird lovers who found their first inspiration in this direction through Dr. Lynds Jones of Oberlin College joined in sending him their affectionate greetings on his seventy-fifth birthday, January 5. None who knew him at Oberlin can forget his enthusiasm, which is unflagging today. It may be that some of our readers enjoyed that opportunity but did not know of his anniversary. If so, it is not too late to drop him a line at 352 West College Street, Oberlin, Ohio.

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THE

Ten-Year Index

(Volumes One to Twenty)

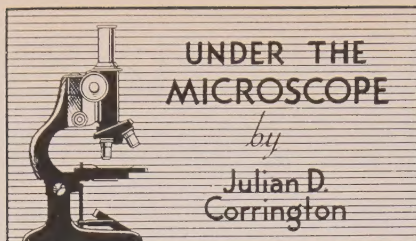
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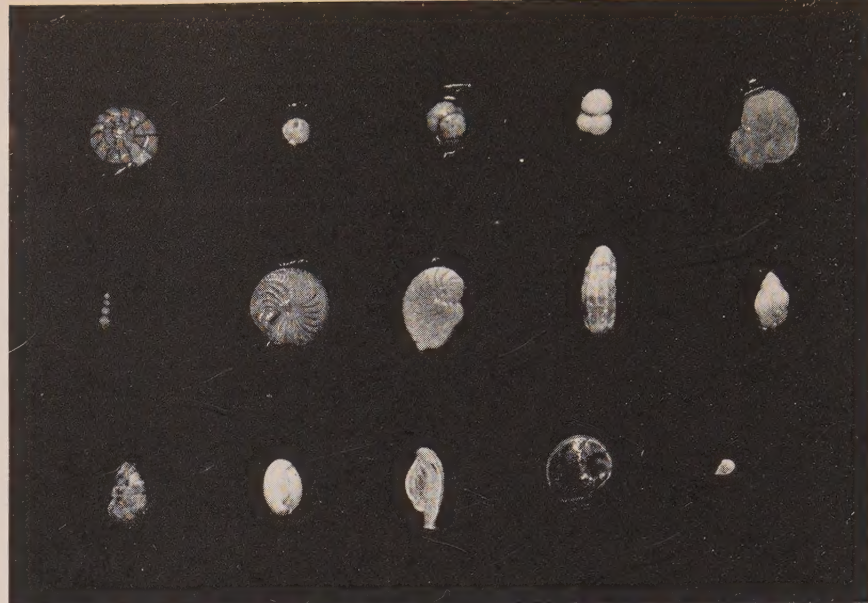


Foraminifera

The average microscopist is reasonably well acquainted with the Protozoa and recognizes the distinctions by which this great group of one-celled animals is divided into subordinate groups. Thus the Class Sarcodina is known by the absence of a thickened outer envelope (pellicle) and the consequent ability to protrude portions of the cell cytoplasm into temporary "false feet" (pseudopodia), whereas two other classes maintain a somewhat more definite shape and progress by means of flagella or cilia.

Several kinds of pseudopodia are known, with or without a stiffening axial rod, and those lacking such a rod are further designated as finger-like, root-like or thread-like. Some secrete a shell of chitin, silica, sand grains or lime, while others are naked and have no shell. The Foraminifera constitute an Order of the Sarcodina in which the pseudopodia are root-like, fine and branching, and with shells which are usually calcareous—composed of calcium carbonate or lime. Typically these animals are marine, large in size for protozoans, and have a shell of several to many chambers, perforated with numerous pores (foramina) through which the pseudopodia are sent forth for locomotion and food capture. The name means pore-bearing, in reference to those fine openings.

As is the case with diatoms, the shells of Foraminifera and radiolaria—another protozoan group which we shall discuss later—present great beauty and variety and offer full play to the instincts for collecting and the development of a skillful mounting technique. Also like diatoms and because of the possession of shells, these protozoans are widely known from early geologic ages as fossils. The forams, as the longer name is frequently abbreviated, make up such well-known formations as the chalk cliffs of Dover, England, and the limestones from which the Great Pyramid of Cheops at Gizeh, Egypt, was constructed. Recently forams have come into great prominence in



AN ARRANGED DRY-MOUNT SLIDE OF 15 DIFFERENT GENERA OF FORAMINIFERA. ENLARGED ABOUT TEN TIMES

oil geology as indicators of oil-bearing strata.

The majority of species creep over the ocean floor, while others float on the surface. On the death of the protoplasmic mass, the shells collect on the bottom, where they make up a conspicuous part of the fine deposits known as ooze. Collections are made by towing a plankton net along the surface, by dredging the bottom, or by processing material from fossil deposits. The average reader of this Department will likely have no access to such sources, but may secure small vials of foram shells at trifling cost from biological supply houses, or by exchange with others who have made this field a specialty.

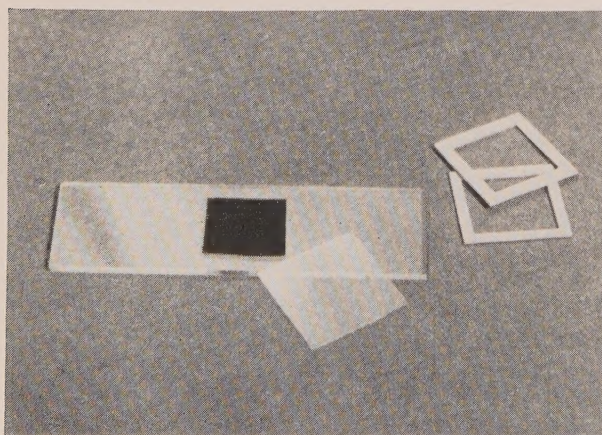
In cleaning material from a lump of chalky deposit, first break the lump into pieces the size of an almond and then gently crush these into a powder fine enough to pass a somewhat wide-meshed sieve. Tie some of this debris into a muslin bag, immerse in water, and knead lightly until reduced to a third of the original bulk. Pour off the resultant milky fluid, refill the bag with water and knead the mass again, repeating this procedure until water coming from the bag is practically clear. Then boil for from one to two hours in a strong solution of bicarbonate of soda and bottle in distilled water the foram shells thus obtained. Whenever you are ready to mount any of these

shells, pipette a number of them upon a blank slide and dry them thoroughly over an alcohol lamp or hot plate.

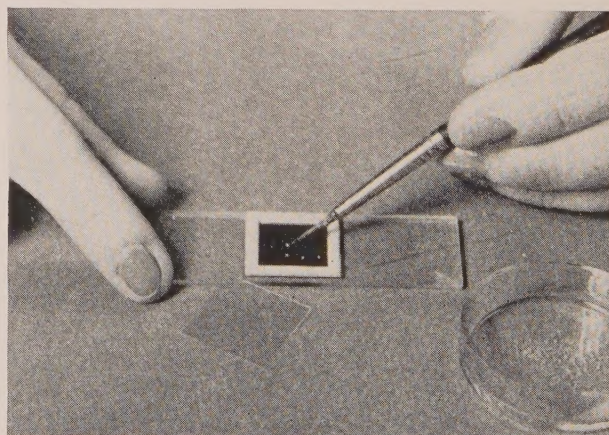
These minute and beautiful shells may be mounted dry or in balsam. For balsam slides, soak the dried shells in either xylene or turpentine for hours or days to expel all trapped air, which will appear black by refracted light. Reject all shells that will not clear up and transfer good ones to balsam on a slide, mounting with cover glass props.

Usually in a strewn mount, where the shells are neither affixed nor arranged, they will drift together or to one edge of the cover glass in time, even when it is thought that the balsam has hardened completely. For this reason arranged slides are preferred, and may be made on either the cover or the slide. Paint the selected area with a fairly thick balsam and transfer each shell separately to its destined location by using a bristle, such as a cat's whisker or a badger hair from a shaving brush. Place the preparation under an inverted tumbler for a week until the balsam has set, then warm gently, add a drop of thinner balsam, and mount. This method will prevent subsequent drifting.

For dry mounts affix a brass curtain ring or bone embroidery ring to the center of a clean slide with Dupont's Household Cement. When this has set, place a tiny spot of gum tragacanth on the slide, inside this ring, at each point where a foram shell is to be lo-



MATERIALS FOR A DRY-MOUNT SLIDE, COVER, BLACK PAPER SQUARE, AND CARDBOARD FRAMES



TRANSFERRING FORAM SHELLS TO GUMMED SPOT IN MAKING DRY MOUNT TYPE SLIDE

cated. As each shell is transferred with the bristle, breathe on the gum spot to soften it, place the shell and arrange its position. The gum quickly sets and retains the foram permanently. Shells may be mounted in rows, as in type slides, used for identification purposes, or may be arranged in geometrical figures, with or without other objects, as diatoms, radiolaria, insect eggs and the like.

When the interior of the cell thus made is completely dry, ring the edge with the cement, flame a cover glass, and press it into place. If a turntable is available, finish off the slide with two or more coats of an attractively colored lacquer. As a variation, try mounting this sort of slide with a circle of black photomount paper at the bottom of the cell, making a slide for use with reflected light; or one with a black half-circle, with some of the forams mounted over the black paper and some over the clear glass.

Historical Outline

More than a year has passed since our last installment under this heading (November, 1938), a silence punctuated by a special Pictorial History (February, 1939), and the beginning of a correlated series on the history of the great optical companies entitled *The Microscope Makers*, and starting off with Bausch & Lomb (May, June-July, 1939). In subsequent installments, the reader is asked to refer frequently to the Pictorial History for illustrative material on the topics covered.

When we left our original *Outline*, we were surveying the early seventeenth century, with its adoption of both simple and compound microscopes as scientific curiosities. The earliest printed representations of microscopes occur in the *Dioptrique* of Descartes (1637), famous French philosopher. One drawing depicts the human eye, before which is a plano-convex lens mounted in a frame, a parabolic mirror to bring light rays to a focal point, and an object holder located at that point.

Another illustration shows a huge compound microscope mounted on a pillar and looking more like the conventional idea of a telescope. A standing human figure is shown peering into the tube, and there is a mirror and condensing lens for concentration of light rays. This enormous instrument was designed by Descartes as an "ideal microscope," but came to be referred to later as a megaloscope. So far as is known such an instrument was never actually manufactured, remaining as a theoretical design, but is of especial interest in showing that reflecting mirrors and condensing lenses were even then considered as necessary adjuncts, in order to concentrate stronger light on the subject under scrutiny. Descartes' work shows also that both simple and compound microscopes were in use in the early seventeenth century. A drawing of the megaloscope appears in our February, 1939, issue.

The illustrations of insects published by Hoefnagel in 1592 and those Mouffet executed about 1590, but did not publish until 1634, gave evidence, as previously stated in this *Outline*, of employment of lenses in securing detail. The earliest known use of microscopes in examining living organisms of microscopic size, however, was an announcement in the *Ars magna lucis et umbræ* of Athanasius Kircher in 1646. This man, a German archæologist and Jesuit priest, referred to the microscopes of Descartes and

others current at the time, and figured his own instrument, described as a spherio-hyperbolic lens equipped with a stage and object-holder. This was a simple microscope, but he also later used a compound model with lenses made of very small glass globules.

By means of these microscopes, as recounted by Locy, Kircher studied decaying materials, milk, and the blood of persons stricken with fever, and described certain minute "Worms" (*vermicula*). What he actually saw were for the most part clumps of blood cells, yet he thought of them as living organisms and assigned to them the causal rôle in infection (*contagium animatum*). He thus remarkably anticipated the modern germ theory of disease, especially in another of his publications, the *Scrutinium pestis* of 1658, and missed by narrow margins wearing the laurels bestowed on both Leeuwenhoek and Pasteur, as brought out in our feature article in December. Unfortunately, his fertile suggestions were lost sight of and not revived until two hundred and twenty years later.

Among Kircher's colleagues was Schott, and, being busy at another task, Kircher had engaged his friend to complete and publish a work on natural magic. This was done, and in 1657 Schott issued, with acknowledgments to Kircher, the *Magia optica*, a work of such popularity as to merit a translation into German. Among many other items, this book included drawings and descriptions of the many types of microscopes then in use; one of the plates was reproduced in our February, 1939, issue.

It seems strange to us today, but it is a fact that many of the pioneer users of microscopes preferred the simple type to the compound. This was notably the case with Anton van Leeuwenhoek (1632-1723), greatest of all Dutch microscopists, and a figure who bulks so large in our science as to require more extended treatment than has been accorded any one thus far in our story.

Beginner's Primer

We are interrupting our series on insect classification this month to make way for an idea sent in by Margaret Murley, ASAM member from Sumner, Iowa, where she teaches biology in Junior High School. While working up a unit on use of the microscope Miss Murley wanted information on the meanings of the many designations seen engraved on oculars and objectives, and it seemed to us that other readers would also welcome such explanations. So here they are.

Microscope manufacturers at first used arbitrary symbols, such as 1, 2, 3; I, II, III; or A, B, C, the first in each series indicating the lowest powers. When optical instruments came into general use, however, there was a demand for some form of designation that would give information as to relative performances, and the first scheme adopted for objectives was that of showing the E. F. in inches (British and American manufacturers) or millimeters (Continental firms). E. F. is the standard abbreviation for *equivalent focus*, which means that at some selected distance the combined lenses of an objective would give the same magnification as would a simple lens of the stated focus.

For example let us take the most commonly used school microscope, provided with a double nose piece carrying a "low power" and a "high power" objective. The



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shortest one of the two, the low power, is made by combining two separate doublets, each doublet being two lenses cemented together. The total work of the four lenses is to bring an image of a certain magnification to a focus at a certain distance, and while it would not be proper to consider this the focal length of any one of these four lenses, or all four combined, yet the objective gives a result, as far as the observer is concerned, of a simple magnifying glass whose focal distance is $\frac{3}{8}$ inch. Hence the equivalent focus of the compound objective is $\frac{3}{8}$ inch, and an American manufacturer of twenty-five years ago would engrave $\frac{3}{8}$ upon the brass shell of this objective. The result in each case—both simple lens and compound objective—is an image magnified ten times, but the combination has the advantage over the simple lens of including corrections for a number of defects, and the image is hence far more perfect.

More recently American concerns have adopted the metric system, and the $\frac{3}{8}$ objective would be engraved 16 or 16mm, the E. F. in millimeters. The high power objective is similarly marked as $\frac{1}{4}$ (inch) or 4 (mm). Still more recently it has become the custom to include the actual magnification, either in place of or in addition to the E. F. The 16 objective is then designated as 10X, the 4 as 43X. This gives the initial magnifying power—that of the objective only.

Objectives must be made with certain conditions in mind under which they are to be used, in order to correct for defects. *Image distance* is one of these factors, and nearly all manufacturers have agreed on 10 inches, or 250 mm, which is assumed to be that distance at which the average normal person sees close objects most perfectly. The E. F. of lenses is hence computed on a basis of this standardized image distance. Another factor is *tube length*, the interval between upper end of draw tube or body tube and the base of the objective, where it screws on the tube or nosepiece. Most manufacturers have in recent years determined on 160 mm as an ideal tube length and correct their lenses to operate at this distance.

The eyepiece, or ocular, after the early A, B, C stage, has been generally marked as 1 and 2, the E. F. in inches, 1 being the higher power and shorter length. Today they are mostly engraved with the magnifying power, the 1 being 10X and the 2 being 5X. Final magnification of any combination being used is determined by multiplying that of the objective by that of the ocular; thus the 10X objective used with the 10X eyepiece gives a magnification of 10 x 10 or 100X.

The numerical aperture (N. A.) of an objective is a mathematical expression indicating the resolving power or ability of a lens to define minute objects and is far more

important than mere magnification. This figure is now usually engraved on the side of an objective. A particular example, before us as we write, has quite a bit of reading matter upon the brass cylinder enclosing the lenses. There is the name and address of the manufacturer around the upper half, followed by "4mm 0.65 43X", the 0.65 being the N. A.

A table showing these features in the most frequently used achromatic combinations is below, the image distance 250 mm, the tube length 160 mm.

Trade Notes

Our canvass of readers on subjects in which they are interested revealed a surprisingly large number of votes for parasitology, and it was hence with pleasure that we received for review the second edition of a monumental and exhaustive work, *Human Helminthology*, by Professor E. C. Faust of Tulane University. The author is widely known in the field of parasitic worms and in this volume he has brought together the existing knowledge of all those forms infecting man, with complete zoological and medical studies and a very full bibliography. This is a large volume of 780 pages and 302 figures and is designed as a reference manual. It should not be attempted by the beginner who lacks suitable background, but the teacher or specialist in parasitology cannot afford to be without it.

There are absorbing chapters on the history of this science, known from ancient times, and on the general biological principles involved, followed by comprehensive treatment of all known worm parasites of man, concluding with methods of diagnosis and treatment, collection, preservation and identification. Much attention is paid to intermediate hosts as important cogs in the life cycles. Lea & Febiger, 600 South Washington Square, Philadelphia. \$8.50.

Catalog-of-the-month for March is a 24-page illustrated booklet by the Graf-Apsco Co., Chicago, featuring their own microscopes as well as many rebuilt models of various other makes; accessories, hand lenses, lamps, supplies and dissecting instruments. This firm lays claim to the distinction of being the oldest and largest rebuilt-microscope house in America, and has had many testimonials as to the quality of its own products as well. Send a 3¢ stamp to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St., N. W., Washington, D. C., for your copy of this catalog.

For some time we have been in search of a human anatomy which we could recom-

mend to those of our readers needing a brief and inexpensive manual on this important background subject. Issuance of a second edition of Dr. Clyde Marshall's *An Introduction to Human Anatomy* has provided that opportunity. Instead of the ponderous and costly tome which one expects, we have here a condensed and elementary but thoroughly adequate treatment together with an ample number of splendid illustrations, many in color; pp. 388, figs. 257. All of the systems of organs are well covered, with emphasis on function as well as structure, and there are separate chapters on histology and embryology. Microscopists featuring structural studies in the higher animals should have a copy of this volume in their reference library. W. B. Saunders Co., West Washington Square, Philadelphia. \$2.50.

American Society of Amateur Microscopists

President, Simon Henry Gage, Ithaca, N. Y.

Permanent Secretary, Julian D. Corrington, Chestertown, Md.

Official organ, *Nature Magazine*, Washington, D. C.

Address all communications concerning the Society to Dr. Corrington at Chestertown, Md. Application for Membership form sent on request. Dues, one year, fifty cents; two years, one dollar.

Many members were introduced to the Society through the interest of John F. Brandt, of the Bausch & Lomb Optical Company, Rochester, N. Y., while others have had occasion to correspond with him, one time or another. They will be glad to know—and will join with us in extending hearty congratulations—that he has been promoted again; this time to the full headship of the Department of Specialty Sales, comprising all items of equipment for amateur microscopy, including the widely known Gem and Model R microscopes as well as many other items.

Our congratulations go also to member Arturo Borges Badell of Santiago de Cuba. Readers will recognize him as author of two former articles, one on a homemade microscope, constructed from cardboard, glue and some Brownie camera lenses (April, 1939) and the other on a bullet comparison photomicrographic camera (November, 1939). The inventor of these ingenious and practical ideas is a writer of note in the field of criminology, particularly as the author of a single fingerprint system, and has just been appointed Director of the Bureau of Identification in the National Police Force of his native city. We anticipate further interesting items from this ardent microscopist in future issues.

Among recent recruits is Dr. E. W. Cordingley, D.S.C., of Clinton, Indiana. He has sent us the November, 1939, issue of *The Chiropractic Record* which features the fourth in his series of articles on "Some Principles of Microscopy," dealing largely with technique of skin sections showing ringworm infections.

Equivalent Focus		N. A.	Initial Magnifying Power	Final Magnification with Huygenian Eyepieces				
Inches	MM			5X	7.5X	10X	12.5X	15X
2	48	.08	2	10	15	20	25	30
1½	32	.10	4	20	30	40	50	60
¾	16	.25	10	50	75	100	125	150
⅓	8	.50	21	105	157.5	210	262.5	315
¼	4	.65	43	215	322.5	430	537.5	645
⅛	1.9	1.25	97	485	727.5	970	1212.5	1455
⅙	1.8	1.30	100	500	750	1000	1250	1500